SCIENTIFIC AMERICAN

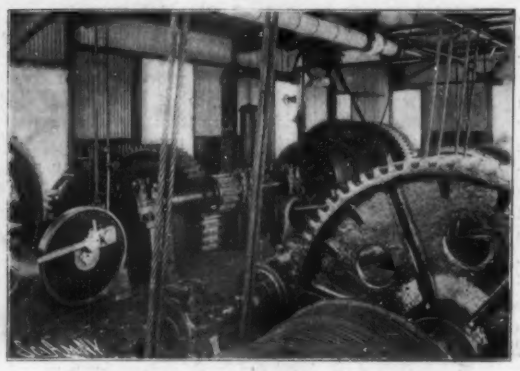
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1903, by Munn & Co.]

Vol. LXXXVIII.—No. 25.] ESTABLISHED 1845.

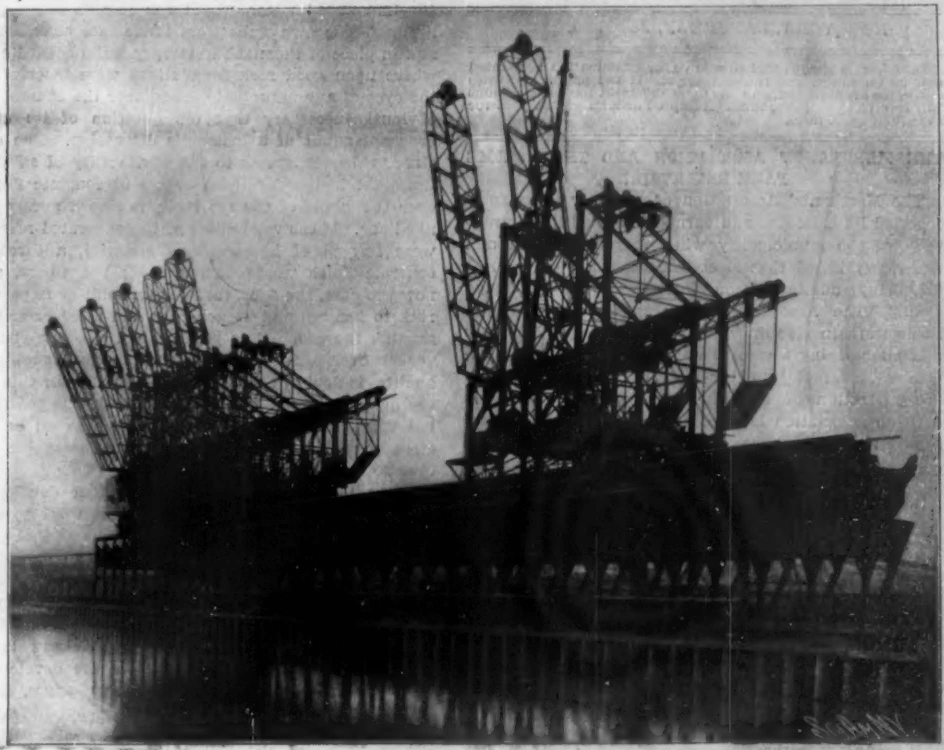
NEW YORK, JUNE 20, 1903.

[8 CENTS A COPY $3.00 A YEAR.

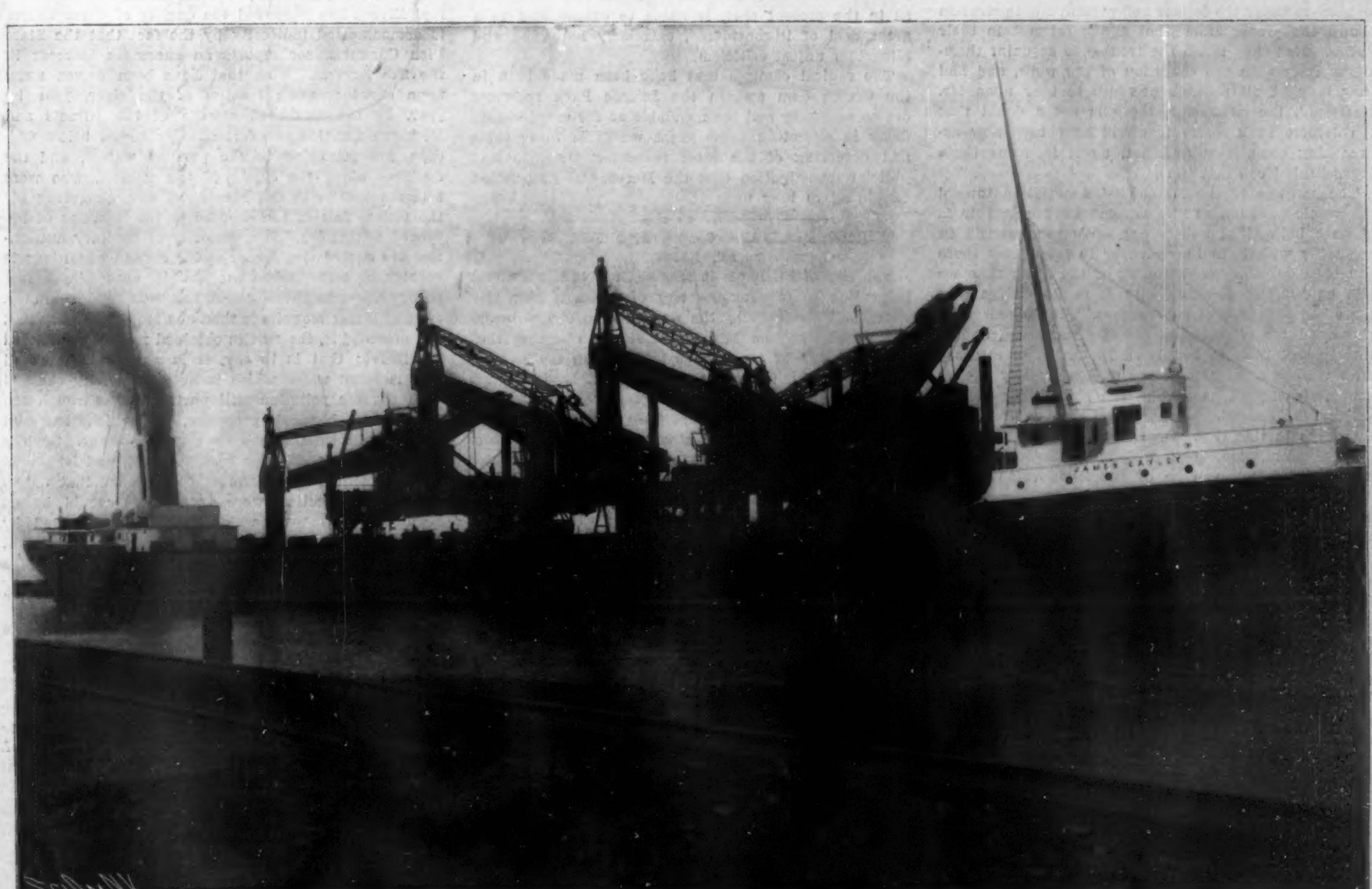
General View of Ashtabula Harbor Entrance.



Machinery for Operating Ore-Unloaders at Conneaut.



Ore-Unloaders at Ashtabula Harbor.



Ore-Unloaders at Work on the Cargo of an Ore-Carrying Steamer.

GIGANTIC ORE-HANDLING MACHINERY.—[See page 469.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) .... $3.00 a year
Scientific American Supplement (Established 1876) .... 5.00 "
Scientific American Building Monthly (Established 1885) .... 2.50 "
Scientific American Export Edition (Established 1878) .... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.

Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JUNE 20, 1903.

The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE MERCHANTS' ASSOCIATION AND THE JEROME PARK RESERVOIR.

The Merchants' Association of this city abundantly justified its existence and earned the everlasting gratitude of the municipality when it ran to earth and effectually killed that most colossal fraud of the last Tammany administration known as the "Ramapo steal." The Association is doing disinterested and noble work in standing guard over the city's interests and maintaining a careful watch for the incipient evidences of actual fraud or culpable negligence in the administration of municipal affairs. The need for such an association is pressing; its members are leading citizens of unquestioned integrity, and no one doubts for a moment the high character of its aims and the singleness of purpose with which they are followed. Although the Association has at times been misled, as it has to a certain extent in its attitude in the present Jerome Park reservoir controversy, the mistakes have been due to the fact that the subject of them was, as in the present case, a highly technical matter, in which the Commission was entirely dependent upon more or less interested technical advisers for its actual or supposed facts. The present attempt of the Association to bring about the impeachment of the Aqueduct Commissioners is not, however, altogether unjustified by the circumstances; for we defy anyone to prove that the interminable delay that has taken place in the construction of Jerome Park reservoir would have been possible, had the Aqueduct Commissioners under the former and present administration shown the proper amount of active interest in their duties. Had they taken the trouble to acquaint themselves fully with the condition of the work, and had they brought all possible pressure to bear upon Mr. McDonald, the contractor, there is not a doubt that the Jerome Park reservoir would have been now approaching completion and not, as it is, some three years behind contract time.

The attitude of the Merchants' Association toward the whole question of the Jerome Park reservoir is at once both right and wrong. We are heartily in sympathy with it in its endeavor to prove that there has been culpable *misfeasance*; at the same time we just as heartily disagree with it in its charge that there has been willful *malfeasance*. The Commission's sins are those of omission, not of commission, and in this respect it is to be placed in the same category with various other superfluous and practically useless commissions, such as that of the East River Bridge, which have encumbered the prosecution of great public works in this city. On the other hand, for proof that a commission, if it will but energetically discharge its duties, can be of enormous value to the city, witness the zeal of the Rapid Transit Commission, whose great work would have been consummated but for labor troubles in the closing days of the present year, or several months before the contract date. The Jerome Park reservoir contract, which was let over eight years ago, was to have been completed last November. At a recent public hearing, the contractor promised that one-half of the reservoir should be ready for water by the opening of the year, a promise that is simply preposterous in view of the present backward state of the work. After a personal visit to the reservoir we do not hesitate to say that the city may be thankful if the western half is finished within twelve months, and that it will be lucky if it gets the whole reservoir in working order within two years from the present writing.

Regarding the complaint of the Merchants' Association that unnecessary changes have been made in the plans of the work, to say nothing of the insinuations of incompetence or worse against the present Chief Engineer with which the complaint of the Association is so liberally seasoned, we have this to say: that, after a careful comparison of the old and new plans, and of the physical conditions existing both at Croton Dam and Jerome Park, there is not only no ground whatever for these charges, but the changes as now being carried out are in every case based on sound engineering considerations, and are due to failure on the part of the engineers who drew up the first plans to fully appreciate the difficult nature of the sites upon which the reservoirs are built, and the conviction of the present Chief Engineer, that in constructing works of this magnitude and importance it is imperative that the work should be in acordance with the very latest engineering practice, and that the dam itself as completed, should be absolutely free from any possible cause of weakness or subsequent failure. As the work developed, it was found that if the original plans were followed, the core walls would have to be built upon a loose material which, under the hydraulic head of the impounded water, would run like so much quicksand. These core walls were immediately condemned, and in place of them solid masonry walls bedded everywhere upon good rock foundations were inserted. In the eyes of any unprejudiced engineer the change is so obviously necessary that the question of its utility does not admit of a moment's discussion. The other structural question, as to the advisability of substituting eight inches for three inches of concrete flooring over the whole of the reservoir, is also a purely technical one. If the whole floor of the excavated reservoir were formed of homogeneous material, a three-inch concrete finish would be sufficient; but where, as is now the case, the floor varies from solid or impervious rock to fissured and broken rock and filled or swampy ground, the proposal to put a thin three-inch concrete veneer over a floor of such a heterogeneous bearing quality, is doubtful on the face of it. To our thinking, the question is not whether eight inches is too much, but rather whether twice eight inches would be sufficient to provide an adequate and unbreakable floor over so variable a foundation.

There is no field of engineering that develops in the course of the execution of a great work so many unexpected obstacles and new conditions as that of the civil engineer, and there is no branch of civil engineering of which this is so emphatically true as that which is concerned with such works as the Croton dam and the Jerome Park reservoir. Plans for works of this character are always somewhat tentative and flexible, and when an engineer finds that in the development of the work, radical and far-reaching changes, involving heavy expenditure and a seeming, but not actual, reflection upon the judgment of his predecessor, are necessary, it is his bounden duty to make these changes. Such a course demands no little professional courage; for the engineer is well aware that his action, as in the present case, is liable to expose him to a great deal of ill-considered, extremely harassing and altogether unjust criticism.

The radical changes that have been made both in the Croton dam and in the Jerome Park reservoir are as necessary and commendable as the exasperating delay in executing these great works is inexcusable and deserving of the most searching criticism and judicial investigation that the Merchants' Association can bring to bear upon it.

CHICAGO DRAINAGE CANAL AND THE CITY OF ST. LOUIS.

The city of St. Louis is seeking to obtain a Federal injunction to prevent the city of Chicago from discharging its sewage by the way of the Chicago drainage canal into the Mississippi River, claiming that this diversion of the sewage is polluting the Mississippi, from which source the city of St. Louis obtains its water supply. It is pretty generally known (and if it is not it should be) that the great Chicago drainage canal was cut through at a cost of $36,000,000 from Lake Michigan to the Illinois River for the purpose of carrying the sewage of Chicago into that river and securing its ultimate discharge into the Mississippi. Previous to the opening of the canal, the sewage of this great city of two million souls had been discharged into Lake Michigan, from which the city draws its water supply.

We have to go back nearly half a century to find the inception of this splendid work, when the project was mooted by E. S. Chesebrough, one of the best-equipped and most far-seeing sanitary engineers of his day; and in the interval it has been indorsed by such men as Prof. John H. Long, Rudolph Hering, George E. Waring, and other qualified authorities. The boldness and originality of the undertaking, its magnitude, and the extremely ingenious methods of excavation adopted in constructing the canal, attracted the attention of the whole civilized world, and the success of the scheme since its inauguration has been such that the Chicago drainage canal stands to-day as one of the most successful of the great engineering works of this or any other age. The proceedings in the suit of the State of Missouri and the city of St. Louis against the canal led to the carrying out by a commission of the Department of Health of Chicago of a very exhaustive examination of the flowing waters between Lake Michigan at Chicago and the Mississippi River at St. Louis, with a view to determining their condition and quality before the opening of the drainage canal, as compared with their condition and quality after dilution with the waters flowing into them by way of the drainage canal. To insure that the facts of the investigation should be ascertained and presented truthfully and impartially, it was originally proposed that the examination should be made by three scientific institutions of high reputation, namely, the Washington University, St. Louis, Mo.; the University of Chicago, Ill.; and the Illinois State University, Ill.; triplicate samples of the waters being collected at the various points selected, and one set sent to each institution for examination. Subsequently it was proposed that for the greater satisfaction of St. Louis, the examination for that city be made in the laboratory of the St. Louis Water Commission. The two Illinois institutions signified their readiness to undertake the work; but as no response was made by the Mayor of St. Louis to the suggestion as affecting his city, the laboratory of the Sanitary District of Chicago filled the vacant place, and the examination was conducted on the triple lines as suggested above. Under the plan that was followed, every week samples of the water of the Illinois and Mississippi Rivers were collected from forty different stations commencing at Bridgeport, Illinois and Michigan Canal; and including La Salle, Illinois River; Peoria, Illinois River; Grafton, Mississippi River; and several points at St. Louis below the Missouri and below the city itself, the last sample being taken from the St. Louis city water supply.

The results of the investigation as gathered and presented in the report of Dr. S. Reynolds, Commissioner of Health, Chicago, clearly proved that running streams, if adequately diluted, do purify themselves from sewage pollution. This is proved by the complete disappearance of any trace of Chicago sewage in the Illinois River long before it reaches Averyville, and in the better quality of the Illinois River water as it merges into the Mississippi at Grafton than that of the Mississippi itself. It must be admitted that after reading carefully the report before us, the bugaboo of Chicago sewage injuriously affecting the drinking water at St. Louis is completely and effectually disposed of by the work of the investigators. The report of the Laboratory of the City of Chicago was made by Prof. Gehrmann; that of the University of Chicago by Prof. Jordan; while Prof. Palmer reported for the University of Illinois. That the turning of the waters of Lake Michigan, even with the sewage of Chicago contained in them, into the Illinois and Mississippi Rivers has improved the quality of these waters is demonstrated indirectly by the fact that the State Fish Commissioner reports an enormous increase in the fish harvest. Fish that have been driven away from ever-increasing reaches of the river, year by year, by the undiluted sewage of the Illinois and Michigan Canal, and of the larger towns below Chicago, are returning to the purified waters, and the denizens along the banks of the Illinois, who were hitherto hostile to the canal, are now clamoring for the fullest flow of the channel in the interests of improved navigation. The majority of sanitary authorities are agreed that water under certain conditions is capable of self-purification; and in view of the fact that the present investigation has been conducted on a scale of larger magnitude than any similar inquiry that has preceded it, the results obtained may be considered conclusive; that is to say, it is now clearly proved that running water which is not too heavily charged with organic pollution will purify itself through the natural biochemical processes, of which bacterial action and insolation are the most important. Such is Dr. Reynolds' conclusion in his report, and he points out pertinently that "it must be conceded that unless this self-purification were true, there would be no such thing as pure water in streams affected by human habitancy." Among the many facts brought out in the investigation that prove the existence of a process of self-purification in running water, it may be mentioned in closing that a study of the death rate among the colon bacteria added to the river water in sewage combats the idea that typhoid bacteria will survive passage down the river; for it was found that the colon bacteria, which are present in large numbers in Chicago sewage—undoubtedly in much larger numbers than the typhoid bacilli—disappear almost completely in less than 150 miles flow. It is urged by Prof. Jordan that since all investigators are agreed that the colon bacillus is more hardy than the typhoid bacillus and can live in water for a longer time, there is every reason for supposing that the latter microbe dies out with at least the same rapidity.

THE OLDEST MAP OF ROME.

There is preserved in Rome an interesting document, which is the oldest plan of the ancient city of Rome in existence. The Forma Urbis, as it is called, was cut upon 140 pieces of marble of various sizes, and

covers a superficial area of 266 square meters. It was made during the reign of Septimius Severus, between 203 and 211 A. D., and was attached to a wall of the Templum Sacræ Urbis, the present church of SS. Cosma e Damiano. The most curious feature of this map is that some sections or divisions of the city are represented upon a much larger scale than the other parts. This is notably the case respecting the Palatine and Roman Forum. The reason for this distinction antiquarians and archæologists have failed to adduce, and the peculiarity rendered it a difficult matter to piece the fragments of the map together correctly. It is also evident that the relic is the product of several different hands, since some portions are very skillfully and diligently prepared, while others are very negligently made. The map was also permitted to fall into disrepair, and fell to pieces in the course of time. The first fragments were found in 1562 and roughly placed together by Antonio Cosio, but the work of building up the map has been diligently continued ever since, until now 1,049 pieces have been found and joined together. That the map was originally of a tremendous size is testified by the fact that according to Prof. Lanciani, the present portion of the plan is but a fifteenth of the whole. This Forma Urbis is of immense value to archæologists, since by its aid several parts of ancient Rome, hitherto unknown, have been found.

A MUD-PUDDLE COMMUNE; OR, THE BEGINNINGS OF MIND.

The varied and multitudinous forms of life which are to be found in a road-side mud-puddle are as wonderful as they are diversified and numerous. Although I have chosen to entitle this paper "A Mud-Puddle Commune," it must be confessed that these organisms hold nothing in common save the water in which they dwell. For theirs is not the peaceful and quiet existence of the ideal commune; many a terrible tragedy of violence and murder, aye! of infanticide, filicide, fratricide, patricide, and insensate cannibalism takes place beneath the calm surfaces of these turbid pools during each second of time.

Several years ago in my work on mental traits in the lower animals ("The Dawn of Reason," The Macmillan Company, 1899) I advanced and demonstrated (so I believe) the proposition that notwithstanding the fact that the nerve-*cell* is not differentiated in these primal forms, nerve-elements are, nevertheless, present in these, and serve to direct and control life. In a letter to me the late Dr. Elliott Coues wrote as follows: "It seems to me that you express a *great fact* when you speak of neuroplasmic as well as nerve action proper; for otherwise we cannot account for the amount of nerve an amœba certainly possesses."

Mind acts in two ways—consciously and unconsciously; and the conscious mind is, unquestionably, the offspring, the true and logical descendant of the unconscious mind. Consciousness is the result of sensual perception, and there can be no question but that the unconscious, vegetative mind was in existence long before the first sense was evolved. Yet these lowly creatures, whose life cycles are almost purely vegetative in character, every now and then give evidences of sense perception (although no sense-organ can be made out) which fact clearly leads up to the conclusion that the nerve-plasma itself must necessarily contain the elements of consciousness to a certain extent.

In all probability, the lowest forms of animal life are to be found in the sub-kingdom, Protozoa, and every mud-puddle is rich in protozoan specimens.

Under a lens of high magnification a protozoan appears as a little mass of animal matter or protoplasm, cell-like in shape when it is quiescent. Suddenly, while it is under observation, a small, teat-like protuberance will make its appearance on its surface. This protuberance will prolong itself into a narrow arm or foot (*pseudopod*) along the surface of the glass slide. The body-substance of this queer creature can then be seen flowing toward the distal end of the out-reaching arm or foot, until finally, all of the protoplasm has gone into it, and the protozoan has progressed just the length of this pseudopod.

In its wanderings over the stems of grasses and stalks of algae in the waters of its turbid home, every now and then it will find a starch-cell which has escaped from some over-ripe spore, and it immediately begins to avail itself of its welcome "find." It drags itself close to the starch-grain; a little pouch infolds on its surface; this pouch rapidly surrounds the starch, until the latter soon finds itself on the inside of the hungry animalcule; there is a charming movement of the protoplasm of the protozoan and the starch-grain is soon disintegrated and its nourishing elements absorbed. And its indigestible portions—what becomes of them? The little animal simply reverses the *infolding* process, and puts itself *outside* of all the substances it can not digest.

If microscopic crystals of uric acid be placed upon a slide which has an amœba on it, the protozoan will pass them by; or, if it does ingest a crystal, it will immediately proceed to get rid of it. On the contrary, if grains of sand be sprinkled on the slide, the amœba will take them in and will retain them some time before eliminating them. Each grain of sand, in all probability, has upon its surface colonies of microbia, too small to be made out by the microscope, yet large enough for the amœba to recognize them as a source of sustenance. The crystals of uric acid contain no microbia, hence the amœba readily recognizes the fact that they are not good for food. Again, if starch grains, sand, and uric acid crystals be placed upon the slide, the protozoan will show conscious choice by giving the starch grains preference.

On one occasion while examining a bit of alga there suddenly appeared in the field a colony of delicate, tulip-like, or bell-like organisms which appeared to grow upon stalks. I moved the slide slightly when, immediately, every creature disappeared as if by magic. In a few moments, however, these queer "jumping jacks" again popped into view and I then recognized them; they were *vorticellæ*, "bell animalcules," belonging to *Infusoria*. When I moved the slide, currents were set up in the water which spelt danger to the *vorticellæ* and they, therefore, coiled themselves on their stalks and sank down upon the bit of alga, feigning death! I discovered, after experimenting, that they soon became accustomed to the sudden currents in the water of this miniature sea made by moving the slide, and that such cause would no longer occasion them to "play 'possum."

Still more wonderful is the action of the rotifer, *Brachionus urceolaris*, in the presence of the giant water-beetle, *Dyticus marginalis*. This little animal recognizes its enemy, through some unknown sense, stops the movement of every cilia, and sinks as though smitten by sudden death! Some of the nematoids or threadworms will also feign death when they encounter *Dyticus*, and will hang motionless in the water like bits of thread or bleached and dead algæ. The water louse, familiar to everyone, gives evidence that it possesses, comparatively speaking, a high degree of mental development. On one occasion, while observing the action of one of these active little beings, I saw it approach a ruptured starch cell, seize a grain of starch, and then hide behind a bit of mud until it had devoured its delicate morsel. It then came back to the ruptured cell, procured another grain and again retired to its hiding place. This it did several times, thereby evincing memory, conscious choice, and conscious determination. JAMES WEIR, JR., M.D.

HIGHEST WIND RECORD.

Point Reyes, an important United States weather bureau and storm signal station, located on the California coast some 35 miles north of San Francisco, holds the world's record for high, strong, continuous winds.

Last year Point Reyes captured this honor from the weather stations of the earth, and again this month (May) has gone several notches higher on the meteorological scale.

On May 18, 1902, the wind at Point Reyes attained a velocity of 102 miles an hour, and, for several minutes was rushing along at the furious rate of 120 miles per hour.

A fearful gale lasted for three whole days, and at one time the winds in a playful mood ripped the cups from the anemometer. The number of miles recorded during the 72 consecutive hours, was 4,701, which would be equivalent to nearly one fifth the distance around the earth in three days.

This year on May 14 the winds commenced to blow again with the greatest violence. For four days the velocity registered averaged more than 60 miles an hour. For nine days the average velocity was 52 miles an hour. The total number of miles recorded on the anemometer was 11,223 miles.

This is the highest velocity of wind for the time on record in the world.

These automatically marked records will be photographed by Prof. McAdie, who is in charge of the main weather bureau office in San Francisco, and sent to Washington.

FAILURE OF THE MONOLITH LATHE.

Further details of the failure of the great monolith lathe are now available. It will be remembered that the Cathedral of St. John in New York is to have thirty-two granite columns in the choir each 54 feet high and 6 feet in diameter, their weight being 160 tons each. It was intended that these columns should be monoliths, but it was found impossible to turn such huge blanks even in the great lathe which was built to receive them. In the SCIENTIFIC AMERICAN for January 12, 1901, we illustrated the lathe and the turning of one of the columns. The blanks weighed 310 tons, and they were placed on the lathe, whose bed is 86 feet long, which weighs 135 tons and swings 6 feet 6 inches. Eight tools were used, each taking a 3-inch cut. The turning operation proceeded smoothly, the lathe was operated day and night and the column lacked only a few hours of completion, when late one night it broke in two, entailing the loss of a year's time, to say nothing of the valuable piece of stone. The second monolith never reached the polishing stage, for it gave way while being rounded into shape. It is perhaps not fair to say that the lathe failed, although the result was the same. The accident should undoubtedly be attributed to the great torsion which deformed the block beyond the modulus of elasticity. The third attempt was also a failure, and the company deemed it inexpedient to risk any more columns of the monolithic type, so they are now being made in two sections. They will be towed to New York from Vinalhaven, Maine, on a barge, four sections at a time, and will be landed at the foot of West 32d Street, and they will then be rolled to the cathedral. Had it been possible to produce the monoliths, they would only have been exceeded in size by those of St. Isaac's Cathedral, in St. Petersburg.

SCIENCE NOTES.

The municipal authorities of London and other large provincial cities in England are experiencing a peculiar difficulty in connection with the wood paving of the thoroughfares. The wood blocks after they have been laid down are susceptible to a species of fungus which attacks the wood vigorously and rapidly deteriorates it. The authorities are strenuously endeavoring to check this malignant fungus, since the damage wrought by it amounts to several thousand dollars annually, but the only reliable means of checking it, however, is to closely examine the wood blocks before they are laid down. Should a contaminated block be put down the fungus will immediately spread to the surrounding paving, with the result that the whole is soon destroyed.

An expedition has been sent out under Dr. George Shattuck, for a scientific survey of the Bahama Islands. In the party are members of the faculty of Johns Hopkins University and officials of the United States Museum, including Bashford Bean, chief of staff for marine zoology, and J. H. Riley, chief for land zoology; also Dr. Oliver F. Fossig, of the Weather Bureau. Bernard N. Baker has given the party a glass-bottomed boat through which to study life in tropical waters. Dr. Fossig will use several huge kites with registering apparatus to study the trade winds and magnetic conditions. The windlass about which the wire rope to govern these kites will be wound weighs 500 pounds. T. H. Coffin, of Johns Hopkins, will make a special study of the mosquitoes, particularly as to their capacity for carrying disease germs.

In a recent lecture M. Charles Rolland inquires if it be true that human beings expend, in general, far less energy of motion than do the other animals, and he answers the question in the affirmative. To demonstrate the assertion rigorously it would be necessary to perform exact mensurations not yet accomplished, to measure the mechanical energy corresponding to equal nutritive action, both in men and in animals. But if we consider the production of motions in the animal and in the human kingdom it is easy to see that men are inferior, especially in respect of locomotion. The inferiority begins at birth, since it is necessary to teach painfully our children to walk, And it continues throughout our lives, during which we are subject to a thousand affections of the motor apparatus, and on the threshold of old age to senile impotence. This latter is invariable for men but the rarest thing in animals. The variety of animal locomotion is remarkable. Animals fly, swim, crawl, jump, etc., all without the painful apprenticeship of men; and the force they expend, relative to the weight of their bodies, is immensely greater than is the case with us. The beetle is a hundred times as strong as a horse, weight for weight, and the horse is stronger than a man. If men were, relatively, as strong as beetles they could juggle with weights of several tons. These and other like facts lead to the obvious conclusion that the motor functions occupy in the totality of physiological activities a far less important place with men than they do with animals. As an organism rises in the scale and as its nervous system increases in complexity the nervous energies have less and less power to express themselves in exterior reactions, in motor reactions for example. There is, in this point of view, the same difference between men and animals that is found between men of thought and peasants. The former are quiet, but expend their forces in intellectual effort: the latter spend their energies in movements which are for the most part automatic. Animals move less the more they think and the more they comprehend. As Anatole France says in "Clopinet": "I have always sought to comprehend and in the effort I have wasted precious energies. I discover too late that not-to-comprehend is a great power. If Napoleon had been as intelligent as Spinoza he would have written four quarto volumes in a garret"—and that would have been the end.

ORANGE CULTURE IN CALIFORNIA.

The fruit industry of California was founded at the time of the establishment of the missions of the Franciscan monks. As early as 1792 there were about 5,000 trees growing at the different missions. Apples, pears, oranges, lemons, limes, and olives constituted the greater portion of these trees. As they nearly all did well, they proved the possibility of fruit culture in California. The fruit era did not begin until about the time of the great gold excitement of 1849. Most of the emigrants to the State thought of nothing but gold; but a few of the more far-seeing obtained possession of some of the old orchards, and reaped a handsome profit by selling their fruit at the exorbitant prices that then prevailed.

Much of the land in California is especially adapted to the cultivation of citrous fruit. While by far the greater portion of the commercial crop of the State is at present grown in Southern California, the citrous fruit can be safely and profitably grown along the foothills bluffs or foothills in soil of a deep, gravelly, porous nature. So boundless is the market that, although thousands of young trees are yearly planted, there is still room for more.

A TYPICAL CALIFORNIA ORANGE RANCH.

GRADING THE ORANGES.

PACKING THE FRUIT FOR SHIPMENT.

of the Sierra Madre Mountains from San Diego to Tehama Counties, a distance of over 700 miles.

The method of propagating citrous trees such as the orange does not materially differ from that employed in the propagation of other fruit trees. One of the most difficult questions which the prospective orange grower must decide, is whether to use seedling or budded trees. The *pros* and *cons* of the question cannot be discussed here. The general tendency of progressive growers is to use only trees budded with thoroughly tested and approved varieties. Practically all the advance that has been made in improving citrous fruits by propagating and selecting seedlings, hybrids, and the like which produce superior or peculiar fruits, depends upon propagation by budding and grafting. The center of orange culture in California is Oroville, in Butte County, about 450 miles north of Los Angeles. The climate is especially adapted for the cultivation of citrous fruits, and is so mild that the frost never injures the trees.

Throughout the Sacramento and San Joachim valleys orange trees are planted in in preparing the land for orange cultivation, plowing and harrowing both ways is necessary in order to fit the soil for the orange tree. Irrigation is also necessary, because of the scant summer rains. Water is piped to the lands in a common ditch with a gentle slope, and a regular flow of irrigating water is obtained. Since orange growing exhausts the soil in time, fertilizers, both natural and artificial, must be freely used. February, March, and April are the months when the ground is plowed and cross-plowed; afterward it is harrowed each way to within three feet of the trunks. The soil under the trees is cultivated by gangs of men. Trees are planted 25 feet apart, or 70 to the acre. Year-old seedlings are procured from the nurseries, which seedlings in three years attain a strong growth. When the trees are ready to bud they are pruned, all the upper branches being cut off, so that nothing but the forked stump, some three or four feet high, is left. Two T-like incisions are made in the bark, into which incisions the new bud is inserted. About two buds are inserted in each trunk. All superfluous growth is checked, and every atom of nourishment directed toward the development of the new graft. February and March is the time for pruning; September and October the time for budding. May, June, July, August, and September are devoted to cultivation and general oversight. In November the fruit begins to mature, and all else is dropped in order to gather the crop. The gathering season is in full operation by the middle of the month; every man, woman, and child must work to pick, pack, and ship the ripe fruit.

Three years after budding, or six from planting the seedlings, the trees begin to bear. The first crop is 280, the second 420, the third still greater, and that of each succeeding year slightly more than its predecessor, if cultivation be never neglected. Neglect is promptly indicated by shrinking and discolored foliage and diminutive fruit.

The oranges cultivated are Washington navel and tangarines. Co-operation among the neighboring orchards provides for handling and shipping the ripe fruit. A central packing house receives the fruit from the orchards. The highest grade is 80 to the box, diminishing to 96, 112, 126, 140, 150, 176, and 200 to the box. A hopper is employed, into which the fruit is dumped, the sizes being separated in passing down the incline, the fruit dropping in its proper opening.

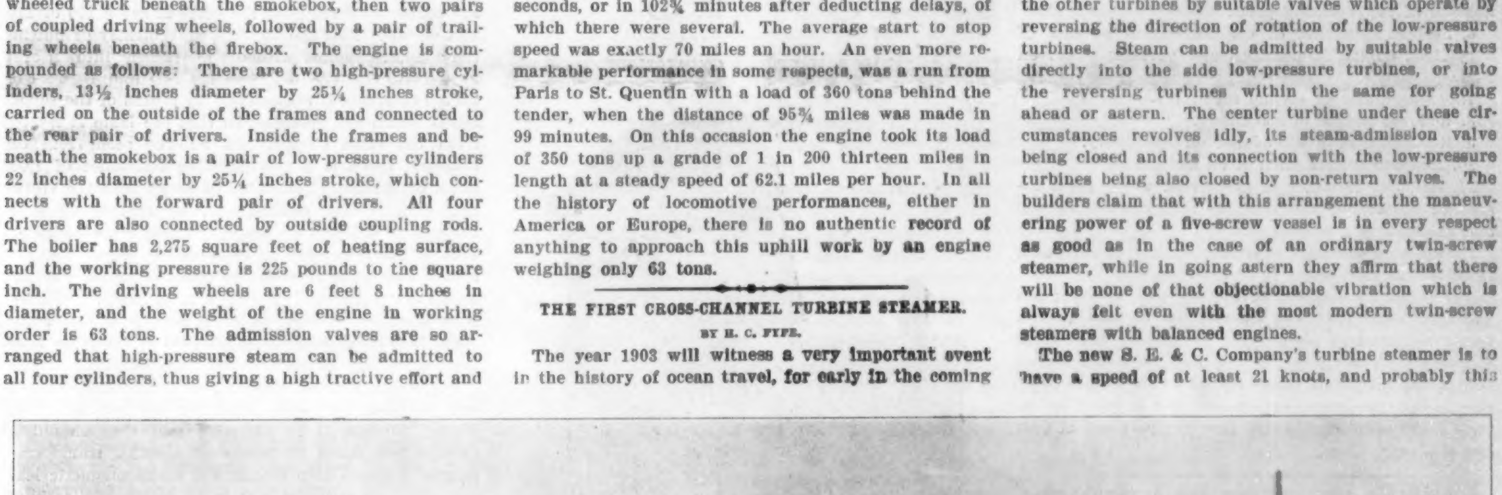
HARVESTING TIME IN A CALIFORNIA ORANGE ORCHARD.

FRENCH EXPRESS ENGINE FOR AN ENGLISH RAILROAD.

Attention has once more been drawn to the splendid French express locomotives compounded on the de Glehn system, by the announcement that one of these engines has been ordered for service on the Great Western Railway, England. There was a time, not so very many years ago, when the English service of express trains was the fastest and most frequent in the world, and its engines, especially designed for fast running, were noted for their economy and the all-around ability with which their work was done. During the past few years, however, the French railways have made a remarkable advance in the speed and general quality of their fast passenger service, until to-day their trains are considerably the fastest in the world. These results are due more than anything else to a remarkably fine type of compound engine, which was brought out and developed by the inventor A. G. de Glehn, Directeur Générale of the Societé Alsacienne de Constructions Mecaniques. The engineers of the various roads that have built compound engines on this system have introduced such minor modifications as were necessary to conform to the requirements of their respective roads. We present a photograph of one of this type which has been doing some great work on the Chemin de Fer du Nord.

The new engine for the English road will be similar to the one here shown, only such modifications being made as are necessary on account of the lower bridges and somewhat narrower distance between platforms on the Great Western Railway. In respect of the number of wheels and method of disposing them, the engine is of what is known in this country as the Atlantic type. There is first a four-wheeled truck beneath the smokebox, then two pairs of coupled driving wheels, followed by a pair of trailing wheels beneath the firebox. The engine is compounded as follows: There are two high-pressure cylinders, 13½ inches diameter by 25¼ inches stroke, carried on the outside of the frames and connected to the rear pair of drivers. Inside the frames and beneath the smokebox is a pair of low-pressure cylinders 22 inches diameter by 25¼ inches stroke, which connects with the forward pair of drivers. All four drivers are also connected by outside coupling rods. The boiler has 2,275 square feet of heating surface, and the working pressure is 225 pounds to the square inch. The driving wheels are 6 feet 8 inches in diameter, and the weight of the engine in working order is 63 tons. The admission valves are so arranged that high-pressure steam can be admitted to all four cylinders, thus giving a high tractive effort and rapid acceleration at starting, and a reserve of power on grades.

The work accomplished by these engines, when judged in the light of their weight and fuel consumption, is undoubtedly better than the performance of any class of locomotives in the world. The Chemin de Fer du Nord, which for several years has been notable for its fast expresses, provided during the season of 1902 twenty additional express trains, whose running speed averaged from start to stop 55 miles an hour and upward. Eighteen of these trains were scheduled to run at 56 miles an hour and upward; twelve at over 57 miles an hour, nine at 58 miles an hour and over, three at over 59 miles an hour, and two at over 60 miles, the fastest train being scheduled at 63.5 miles an hour. The trains are by no means light, averaging about the same as our Empire State Express, or say 200 tons. The most remarkable work done by these engines has been in hauling heavy express trains on upgrades, when very high speeds have been reached and maintained. Thus, with a 225-ton train on a run of 78¾ miles from Paris in 77 minutes and 44 seconds, a steady speed of 65 miles an hour was maintained up a grade of 1 in 200. On another run a speed of 64.6 miles an hour was made on an upgrade of 1 in 250, the run ending at Arras, the 120 miles from Paris having been made in 115 minutes and 25 seconds, or in 102¾ minutes after deducting delays, of which there were several. The average start to stop speed was exactly 70 miles an hour. An even more remarkable performance in some respects, was a run from Paris to St. Quentin with a load of 360 tons behind the tender, when the distance of 95¾ miles was made in 99 minutes. On this occasion the engine took its load of 350 tons up a grade of 1 in 200 thirteen miles in length at a steady speed of 62.1 miles per hour. In all the history of locomotive performances, either in America or Europe, there is no authentic record of anything to approach this uphill work by an engine weighing only 63 tons.



TYPE OF NEW FOUR-CYLINDER COMPOUND EXPRESS ENGINE BUILDING FOR THE GREAT WESTERN RAILWAY, ENGLAND.

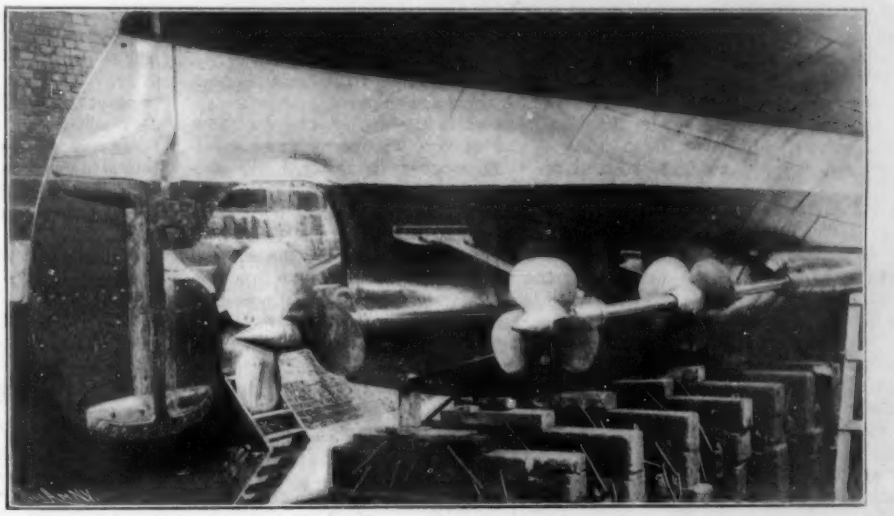
Cylinders: Two high-pressure, 13½ inches diameter, two low-pressure, 22 inches diameter; common stroke 25¼ inches. Heating surface, 2,275 square feet; steam pressure 225 pounds. Driving wheels 6 feet 8 inches diameter.

THE FIRST CROSS-CHANNEL TURBINE STEAMER.

BY H. C. FYFE.

The year 1903 will witness a very important event in the history of ocean travel, for early in the coming year there will be placed on the Dover-Calais service the first turbine-propelled cross-channel passenger vessel ever built. The new vessel now building for the S. E. & C. Railway Company by Messrs. William Denny & Brothers, of Dumbarton-on-Clyde, is expected to create a revolution in cross-channel passenger traffic by reason of her high speed, superior comfort, and great convenience. Her dimensions are as follows: Length, 310 feet; beam, 40 feet; number of turbines, three; number of propellers, five; speed, 21 to 22 knots. With regard to her beam; this (40 feet) it may be noted is five feet broader than any existing cross-channel steamer. She will have effective bilge keels fitted for the greater part of her length. The accommodation for first-class passengers is placed forward of the machinery space, instead of aft, as it is in all the present paddle-wheel vessels on the Dover-Calais service. On the upper deck are the private cabins, and the promenading area of this deck will be covered by a shade or boat deck.

The propelling machinery will consist of three Parsons steam turbines, one high-pressure and two low-pressure, each actuating one line of shafting. The center shaft has one propeller, while the two side shafts each carry two, so there will be five propellers in all. The center turbine will be high-pressure and the two side turbines low-pressure. When steaming ahead, the steam from the boilers is admitted to the high-pressure turbine, and after undergoing expansion about five-fold it passes to the low-pressure turbines, and is again expanded in them about another twenty-five-fold. It then passes to the condensers, the total ratio of expansion being about 125-fold, as compared with 8 to 16-fold in ordinary triple-expansion reciprocating engines.



PROPELLERS OF THE NEW DOVER-CALAIS TURBINE STEAMER.

When going full speed ahead, all the lines of shafting, central as well as side with their propellers, are in action; but when coming alongside a quay or maneuvering in or out of harbor, the outer shafts only are brought into operation; thus giving the vessel all the turning and maneuvering efficiency of a twin-screw steamer. Inside the exhaust end of each of the low-pressure turbine cylinders is placed an astern turbine, controlled like the other turbines by suitable valves which operate by reversing the direction of rotation of the low-pressure turbines. Steam can be admitted by suitable valves directly into the side low-pressure turbines, or into the reversing turbines within the same for going ahead or astern. The center turbine under these circumstances revolves idly, its steam-admission valve being closed and its connection with the low-pressure turbines being also closed by non-return valves. The builders claim that with this arrangement the maneuvering power of a five-screw vessel is in every respect as good as in the case of an ordinary twin-screw steamer, while in going astern they affirm that there will be none of that objectionable vibration which is always felt even with the most modern twin-screw steamers with balanced engines.

The new S. E. & C. Company's turbine steamer is to have a speed of at least 21 knots, and probably this will be exceeded. It is expected that she will accomplish the journey between Dover and Calais in considerably less time than that taken at the present time by the boats on the Channel ferry.

Messrs. William Denny & Brothers are also constructing a second turbine-propelled cross-channel passenger steamer. She is being built to the order of the London, Brighton & South Coast Railway Company, and will

be placed on their Newhaven-Dieppe service. The dimensions of this new vessel are as follows: Length, 280 feet; beam, 34 feet; draught, 22 feet; gross tonnage, 1,100 tons. It is stated that in general design she will be similar to the twin-screw steamer "Arundel" with reciprocating engines, built by Messrs. William Denny & Brothers in 1900 for the Brighton Company. With practically the same boilers as the "Arundel" it is anticipated that the new Brighton Company's turbine vessel will travel half a knot faster, and in addition will be free from all troubles caused by vibration.

The Lancashire and Yorkshire Railway Company in a recent invitation to shipbuilding firms throughout the kingdom for designs and tenders for a new steamer for their Irish Sea service stipulated for alternative designs as regards the means of propulsion, viz., for the ordinary twin-screw reciprocating and for steam turbine engines, the speed desired being 17 knots.

The invention and development of the marine steam turbine is a subject on which Great Britain may well pride herself, for though we have undoubtedly been left behind in various fields of latter-day activity and enterprise, in this particular sphere we took the lead and have maintained it ever since.

Until the new cross-channel turbine steamers have shown their speed and their coal consumption, it is not to be supposed that shipping companies and shipowners will take any very decided move with a view to adopting the turbine as a mode of ship propulsion in place of the ordinary engine of the reciprocating type.

There can be, however, little doubt that before many months have elapsed a turbine-driven Atlantic liner will be built, which will materially lessen the time at present taken by the swiftest steamers of the Hamburg-American and North German Lloyd lines.

Mr. Parsons claims that the principal advantages of steam turbine engines as compared with ordinary engines are as follows:

1. Complete absence of vibration from main engines.
2. Increased economy in steam and coal consumption.
3. Increased speed, owing to diminution of weight and smaller steam consumption.
4. Increased stability of vessel, owing to lower center of gravity of machinery.
5. Increased safety to engine-room staff, owing to absence of reciprocating parts.
6. Perfect balancing of engines, which permits of very light engine foundations and obviates stress on hull.
7. Reduced size of engine room.
8. Reduced weight of machinery.
9. Reduced cost of attendance on machinery.
10. Reduced consumption of oil and stores.
11. Reduced diameter of propellers, which gives increased immersion and obviates racing when rolling and pitching in a seaway.
12. Reduced diameter of propellers, giving increased facilities for navigating in shallow waters.

One might be tempted to inquire why, if these advantages were real, the number of turbine vessels under construction should not be greater than it is at present. The answer to this may be found in the innate and inveterate conservatism of the shipbuilder, who likes to see others experiment, and to delay action until he is perfectly assured that the pathway of success lies before him.

A PORTABLE OSCILLOGRAPH FOR ALTERNATING CURRENTS.

BY THE LONDON CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

A convenient and handy little apparatus for utilization in connection with alternating currents has been introduced by the Cambridge Scientific Instrument Company, Ltd., of Cambridge, England, which should be of incalculable value to manufacturers and engineers who utilize alternating currents. It is the Duddell portable oscillograph, an illustration of which we give herewith.

The increase in the use of alternating currents, especially two and three-phase currents for supplying motive power, and the use by central stations, distributing both on the direct and on the alternating current system, of high-tension alternating currents for the transmission of power over any considerable distance, has rendered a knowledge of the shape of the wave form of the alternating current of the utmost importance to electrical engineers. For instance, alternating-current motors which will work well and have a good efficiency on one wave form may have but a poor efficiency, or may even refuse to work at all, on another. The efficiency of transformers also depends to some extent on the wave form; yet many engineers who are prepared to pay large sums of money for a slight increase in the efficiency of their transformers or motors, do not realize the important effect their wave form has on this efficiency. Again, in the case of cables used for high-tension and extra-high-tension transmission, resonance effects often occur, causing the breakdown of cables and loss of money and prestige due to interruption of supply.

Many of these breakdowns could easily be avoided by an examination of the wave forms, to find out under what conditions dangers to the insulation of the machines and cables occur, in order that these conditions may be avoided in the future. By the proper arrangement of the tests the examination of the wave forms will reveal the dangerous conditions, without, as is often the case, the only warning of a dangerous condition being the breakdown of valuable plant and cables. It is also very probable that the constants of some kinds of alternating-current meters, on the accuracy of which the revenue of the station may depend, are also influenced by the wave forms.

It is of paramount importance that station engineers, consulting engineers, and manufacturers of alternating-current plants should possess a small apparatus for reading quickly and accurately the wave forms for the above. These requirements are fulfilled by this small Duddell oscillograph, which enables an engineer to examine visually the wave forms of an alternating current without the necessity of making complicated connections or employing an arc lamp, synchronous motor, heavy electro-magnet, and other accessories used when a permanent record is required. In order to see the station wave form, it is only necessary to connect the oscillograph in place of a lamp by means of an adapter. The device comprises a small oscillograph set up in a case complete with lamp, rotating mirror, and all necessary resistances, etc., ready for use.

The small oscillograph, which is shown standing outside the case, from which it can be easily and quickly removed for separate use, consists of a single vibrat-

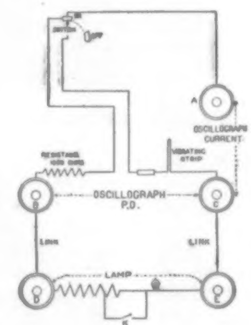
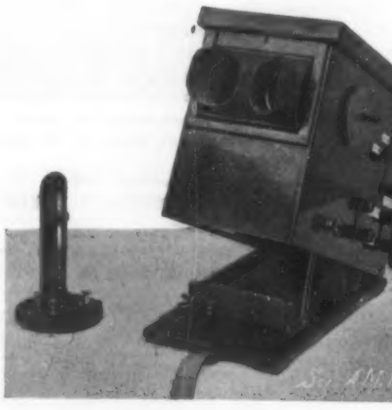


DIAGRAM OF THE CONNECTIONS.



PORTABLE OSCILLOGRAPH.

The smaller instrument can be used separately.

ing system mounted between the poles of a permanent magnet. The vibrating system is connected to the two small terminals shown on the base of the oscillograph, and these in their turn are connected through a suitable resistance by means of flexible wires to the terminals shown on the outside of the case.

The vibrating system consists of a loop of phosphor-bronze strip under tension carrying a small mirror. A beam of light from an incandescent lamp is thrown on to this mirror, and thence is reflected on to a screen forming a bright spot. This spot vibrates horizontally, its deflection from the central position being at any instant proportional to the instantaneous value of the P. D. or current as the case may be. The movement of this spot is observed in a mirror, which is rotated by hand about an axis at right angles to that of the mirror attached to the strip. The handle by means of which the mirror is rotated is shown on the right-hand side of the instrument. The observer examines the wave forms seen in the rotating mirror through eye-holes. A rubber eyeshade prevents extraneous light from entering the instrument when in use. The shade is removable and packs inside the instrument when closed.

The following are the approximate data relative to the sensibility of the oscillograph:

Periodic time, 1-4,000 second as sent out with a tension of 1 ounce.

Sensibility, 200 mm. per ampere at the normal distance of 25 cm.

Normal working current, 0.05 to 0.10 ampere.

Resistance of strips without fuse and connections, about 4 ohms.

Resistance of strips with fuse and connections, about 14 ohms.

A resistance wound on a slate frame is used in series with the incandescent lamp. A key is provided for cutting out some of this resistance, and thus increasing the brightness of the lamp when the wave form is actually under observation. The instrument is used at an angle as shown, allowing a free circulation of air round the lamp resistance. Terminals are provided in order that the lamp may be lit from a separate circuit from that under examination, if desired.

The instruments are generally made so that they may be connected directly to either a 100 to 110, or 200 to 220 volt circuit, but suitable resistances can be made to adapt the instrument to any particular voltage. For high voltages it is advisable to use a transformer.

Another very useful purpose which the oscillograph fulfills is that an engineer can tell at a glance whether a dynamo gives a true sine curve, or what effect a certain transformer, motor, or cable has on the wave form.

The accompanying diagram shows the general scheme of connections. To prepare the instrument for use, it is only necessary to open the case, slip out the brass plate on the front, and replace it by the one with an India-rubber eyeshade which is placed inside. The lid is then closed, and the instrument fixed at a convenient angle by means of a milled head on the right-hand side of the case. The instrument is then ready for use. If the spot is not in the middle of the scale, it can be brought to the center by slightly slackening the milled head underneath the base of the oscillograph and twisting the latter round. When the spot is in the right position, the milled head is screwed up tightly to keep the oscillograph in position.

The gaps in the vibrator must be kept filled with the special oil supplied with the instrument. This is introduced when required by means of a pipette into the oil cup which is placed at the back of the vibrator.

The instrument can be used to show either P. D. or current-wave forms of the circuit under examination. To investigate P. D. wave forms the terminals *B* and *C* are connected directly to the poles of say a 100 or 110-volt circuit. This can be done conveniently by putting the adapter supplied with the instrument into an ordinary lamp holder. The terminals *D* and *E* are connected to *B* and *C* respectively by means of the copper strips which are provided, so that the lamp is lighted from the same circuit. As will be seen from the diagram, there is a non-inductive resistance of 1,000 ohms permanently connected in series with the vibrating strip of the oscillograph, so that the current through it is about 0.1 ampere, which gives an amplitude of about 25 mm. on each side of zero. There is also a resistance of about 90 ohms in series with the Ediswan 'Miniature" 20-volt 5 c. p. lamp. The key *K* is arranged to short-circuit a portion of this resistance, thus increasing the brightness of the lamp when the curves are actually under examination.

For voltages up to three or four hundred, resistances can be used in series with the instrument. With higher voltages it is advisable that they should be transformed down by means of a small transformer having a closed iron circuit and small magnetic leakage. In this latter case it is advisable to disconnect the lamp terminals *D*, *E* from *B C* and to connect them to an independent 100-volt circuit and to earth one of the terminals *B*, *C*, as it is not safe to use the instrument if it is more than a few hundred volts above earth. Another method is to use a number of incandescent lamps in series as a potential divider, the instrument shunting one of the lamps, which must be connected to earth; it is not advisable to use this method for voltages above 2,000 or 3,000 volts.

To investigate current wave forms the terminals *A* and *C* are connected to the potential terminals of a suitable low-resistance shunt in the main circuit. This shunt should have a resistance so that at the maximum current there is a P. D. across it of about 1.4 volts. In this case the lamp must be lit separately from a 100-volt circuit. For both these investigations lamps having strong thick filaments should be used.

The investigation of form factors is easily accomplished by placing a divided scale for the spot of light to fall on, and finding what deflection d corresponds to a steady direct P. D. of 100 volts applied to the instrument; this is the calibration of the instrument, and will remain practically constant, and need only be repeated occasionally. If now the total amplitude D of the vibration of the spot be observed on the same scale for the wave form to be investigated whose R. M. S. voltage is V, then the form factor of the wave is evidently $50\ D/d\ V$ and this quantity is a very useful measure of the degree of danger to insulation of the wave form. The R. M. S. voltage V must be measured in all cases between the terminals B, C of the oscillo-

graph at the same time as the observation of *D* is being made.

The instrument is extremely portable, weighing only 11½ pounds, and measuring, when closed, 14 inches in length by 8 inches wide and 11 inches deep. The price is nominal, only $150 up to 220 volts.

GIGANTIC ORE-HANDLING MACHINERY.

BY W. FRANK M'CLURE.

The introduction this season of electricity as a power for operating Great Lake dock machinery at three of the most important lower lake ports, it is believed, will be a move of great importance to the future of ore-handling. It has been a query for some time as to when electricity would come into general use upon lake docks. It is now claimed that it will simplify the methods of operation, add to the speed, and reduce the cost of operating. The Pennsylvania Railroad Company in January decided to expend more than $100,000 in Cleveland and $27,000 at Ashtabula in the building of power houses and electric appliances upon its lake docks. The entire power system of the Pittsburg & Conneaut docks at the "Carnegie" port of Conneaut is to be replaced by electricity, all the machines to be furnished with power from a central station, with the possible exception of the "clamshell" automatic unloaders.

On the Pennsylvania docks at Ashtabula the work of installing the new electric system has been in progress for several months and will soon be completed. There are five large boilers at this plant. The electricity on these docks is also to be used for splendidly lighting even the most out-of-the-way corners. The plan is to place lights upon every machine. This, with the fact that the Vanderbilt docks at this port are also to be lighted by electricity, indicates that preparations are being made for a large amount of night work in handling ore this season, and that the ore traffic, which is constantly increasing in volume, will demand it.

Another important innovation in connection with the ore-handling industry consists in the constructing of new lake ore carriers with especial reference to the proper accommodation of the Hulett automatic unloaders. Also some forty vessels of the Steel Corporation's fleet are to be reconstructed with the same end in view, at an expense of more than $100,000.

The big steamer "James Gayley" was the first steamer to be built along the lines mentioned. She is named in honor of James Gayley, who is at the head of the ore department of the Carnegie Steel Company. Mr. Gayley has long taken a decided interest in the Hulett unloader, and was responsible for installing it at Conneaut. The accompanying photograph shows a battery of these machines at work in the "Gayley" during the first test, where the conditions within the hold of the vessel permitted of the machines' best work. Ninety-five per cent of the ore was taken out during this test without the assistance of shovelers.

Since that time another test was made in removing the cargo from the steamer "James Hoyt," which is also especially fitted for the "clamshells." This time ninety-eight per cent of the cargo was removed, and it was not thought worth while to put laborers to work in her to shovel out the rest. It was originally intended that the unloaders should make this record, but it had previously been found impossible, owing to the unfavorable construction of lake boats. By means of these machines working under the new conditions, a cargo of 5,500 tons has been removed in five hours. Officials of the United States Steel Corporation witnessed the latest notable test.

In building or rebuilding a lake vessel with a view to adapting it to the Hulett automatic unloaders, the principal operation is the enlarging of the hatches and the moving of the stanchions so as to give more play. On the steamer "Hoyt," for example, the hatches are not more than four feet apart. There are nineteen hatches in all, and the distance from center to center is twelve feet.

The introduction of the Hoover & Mason automatic unloaders at Ashtabula Harbor is an important feature of the present season. These machines have made some remarkable records at South Chicago, where they have been tested during the past two or three years at the docks of the Illinois Steel Company. During the past year the Hoover & Mason battery of ten machines working in a vessel at South Chicago established a record surpassing even the famous machines at Conneaut. By the unloading of 98 per cent of the "Hoyt's" cargo by the Hulett machines in four hours and fifty-four minutes, however, still another precedent was established.

The Hoover & Mason machines rest upon tracks on the docks, and move themselves upon these tracks. The grab bucket with which each machine is equipped has a capacity of more than five tons. It is possible for one of these buckets to make a trip a minute. The ore when lifted from a vessel is delivered either to cars or to the docks. With these machines ore can be taken out of a vessel at an expense of less than one cent a ton. Vice-President Brown and other high officials of the Vanderbilt railroad system witnessed a test of these unloaders at Ashtabula Harbor a few weeks ago. Machines of this style will likely be installed at Conneaut this season.

The interiors of several lake vessels also have recently been equipped especially for this style of machine. By means of a scraper system the portion of the cargo which could not otherwise be reached by the grab bucket is brought within its reach. Among the vessels thus already equipped are the steamer "Victory" and the schooner "Constitution."

The tendency now seems to be to place the grab styles of buckets on all ore-handling machinery. A two-ton grab bucket, for example, is being placed on the King machines at Ashtabula in place of the former style of buckets used on conveyors. Also Samuel and George Swedenborg, of Ashtabula, have invented a new-style grab bucket which has been tested on the portable machines here, and the test has proven highly satisfactory. This new bucket spreads 7½ feet, and will lift 2½ tons. It will dig as well upon the side of a pile as on the level. An advantage is also claimed for this bucket in its being round, thus avoiding corners, in which ore often becomes packed.

To accommodate the vast new machinery which is being installed this season, and to handle the greatly increased marine traffic which must be handled this year, the railroad companies owning so many docks at the various lake ports, also have extensive projects under way for the construction of new channels, the building of new docks and the installing of coal-handling machinery. Trains carrying ore south to the furnaces return to the lakes with coal. An increase in ore traffic is accompanied by a marked increase in coal shipments.

Typical of the railroad improvements to be made, it may be said that the Pennsylvania Company is planning to spend a million dollars on land west of the entrance to Ashtabula Harbor, which has long been known as the "greatest ore-receiving port in the world." Eventually a mile of this territory along the lake will likely be utilized. This work will not all be done this year, of course. Already, however, additional channel room is being excavated and the expenditure of $50,000 for a car-dumping machine has been authorized. The additional railroad yards and the channels and machines are to be used for coal traffic. With the coal traffic entirely removed to the lake front, much additional room for ore on the present extensive docks up the river will be gained.

The Current Supplement.

The excellent article published elsewhere in this issue on the disastrous Paris-Madrid race is to be read in connection with another article on the same subject published in the current SUPPLEMENT, No. 1433, and narrating various incidents which could not in these columns be recorded for want of space. Also of automobile interest are articles on an automobile Pullman car for time table distribution, on devices suggested by the jarring of automobiles, and on the density of petrol for petrol motors to attain the greatest horse power and the most efficient working. The English correspondent of the SCIENTIFIC AMERICAN reviews the work of the British Fire Prevention Committee. Recent experiments of M. Moissan are reviewed. William J. Hammer discusses phosphorescent and fluorescent substances. A short description of Jupiter and his red spot should be read with interest. Henry S. Spackman has prepared a most instructive technological article which bears the title "Manufacture of Cement from Marl and Clay." Sir Oliver Lodge's excellent treatise on electrons is continued. How a storage battery cell can be made at home is set forth in a simple way by Walter Jones. Electrochemists will read with interest the article on the electrolytic manufacture of caustic soda and hypochlorites.

A new composition whereby steel can be more easily welded than formerly was tried recently at the Jefferson Iron Works, Ohio. The process employed consists in welding steel, and especially scrap steel, by putting scrap steel, layer upon layer, in any preferred shape or size, superposing on each layer some of the composition, and heating the entire mass, then subjecting it to mechanical pressure, whereby a homogeneous union of the separate parts is produced, forming practically a single, integral mass, possessing, it is claimed, all the practical qualities and characteristics of the steel billets produced by casting, or by other known methods. A billet was made from scrap steel and put through the furnace and rolls. It came out a perfect piece of sheet steel with smooth edges. This sheet was cut into smaller pieces, from which perfect nails were made. Washers were also made from this piece, and proved satisfactory. The cost of manufacturing the composition, including the making of the billet of scraps, per ton is from 25 to 50 cents, including labor, and therefore not only economical by saving time, but also saving the vast amount of scrap steel. A. S. H.

Correspondence.

Troublesome Gas Engine Gaskets.

To the Editor of the SCIENTIFIC AMERICAN:

The article about troublesome gaskets by A. E. Potter in the issue of SCIENTIFIC AMERICAN of May 16, is well pointed toward a very general defect in seventy-five per cent of the gas and gasoline engines that have come under my observation.

Leaving out the question of unevenness of packing surfaces as clearly a case of poor workmanship, there are two points of construction which, if better understood and applied, will overcome this annoying defect in most cases.

First, wherever possible inclose or confine the gasket to withstand the pressure of the gases against its edge.

This is readily effected in a cylinder head, for instance, by a projecting rim on the edge of the head which fits over the end of cylinder, or in a flange by recessing the seat, etc. A good practice is to make the confining recess in depth only twice the thickness of the gasket. This is a hint to inexperienced engineers not to add more thicknesses should repacking become necessary.

The second point is to groove the packing surfaces both for confined and unconfined gaskets. Many engine makers apparently vie with one another to produce the smoothest packing surfaces.

Because of unequal expansion of the parts of an engine, the inelastic asbestos will seldom be as tight when engine is cold as when hot. When pressure is exerted against the edge of a gasket, the part of the gasket filling the grooves acts against the sides of the grooves as a check, preventing the egress of gas between the slightly separated surfaces. This illustrates the necessity for grooves in the confined gasket.

The grooves help largely to prevent the blowing out of unconfined gaskets. Grooves for small surfaces need not be more than 3/32 inch wide and 1/32 inch deep. On circular surfaces they are made preferably concentric rather than spiral, the former not permitting the escape of gas if the gasket is not forced so as to completely fill the grooves. Many troublesome joints can be much benefited by grooving when it is impossible or inconvenient to confine the gasket. The grooves can be cut by a chisel or machined.

Ossining, N. Y., May 18. R. T. KIPP.

A Jointed Snake.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to your issue of May 16, I do not believe all that your Missouri correspondent says about the jointed snake; neither do I believe you when you say there is no animal known to science as a jointed snake. Neither need you believe the following incident that came under my observation—not as a small boy, but a grown-up man:

Riding along a country road, I saw a snake about thirty inches long and one inch in diameter. Alighting, I struck it with a piece of fence-rail. The blow fell about eighteen inches from the head, and just back of the abdomen. To my surprise, the snake broke in two; the blow was not sufficient to cut it in two. The forward part wriggled and made a little progress forward, before another blow killed it. Noticing a peculiar formation at the break, I pressed with a piece of timber on the tail end, and found it would disjoint in sections of about two and one-half inches. One end of the joints consisted of four short prongs, resembling the root of a human tooth freshly drawn, and the other end had sockets to correspond with the four prongs. Both ends were raw, and a little blood was noticeable. A brother was with me at the time, and readily remembers the incident, and I can give you ample reference as to my veracity. R. P. GETTYS.

Knoxville, Tenn., May 25, 1903.

A Mechanical Method of Measuring Surfaces.

To the Editor of the SCIENTIFIC AMERICAN:

I believe I have invented a process by which the area of any surface, no matter how irregular it may be in shape, can (provided it is not too large) be ascertained by a simple mechanical means, and with absolute accuracy.

I studied it out for the purpose of finding the number of square inches there is in boot and shoe uppers, so that a system could be arranged for giving the correct number of feet of upper leather to cutters, to cut uppers according to the sizes and widths the orders call for, and no useless waste be made.

My method is as follows:

First cut the patterns in heavy paper, exactly to model shape. Next cut, exactly, square inches and fractions in *the same kind and weight of paper*.

Next, using a pair of carefully and delicately adjusted balance scales, place the patterns on one side, and weigh with the paper square inches, used as weights.

No matter what shape the patterns are, when the square inches balance them, it shows the exact number of square inches are equal on both ends of the scales.

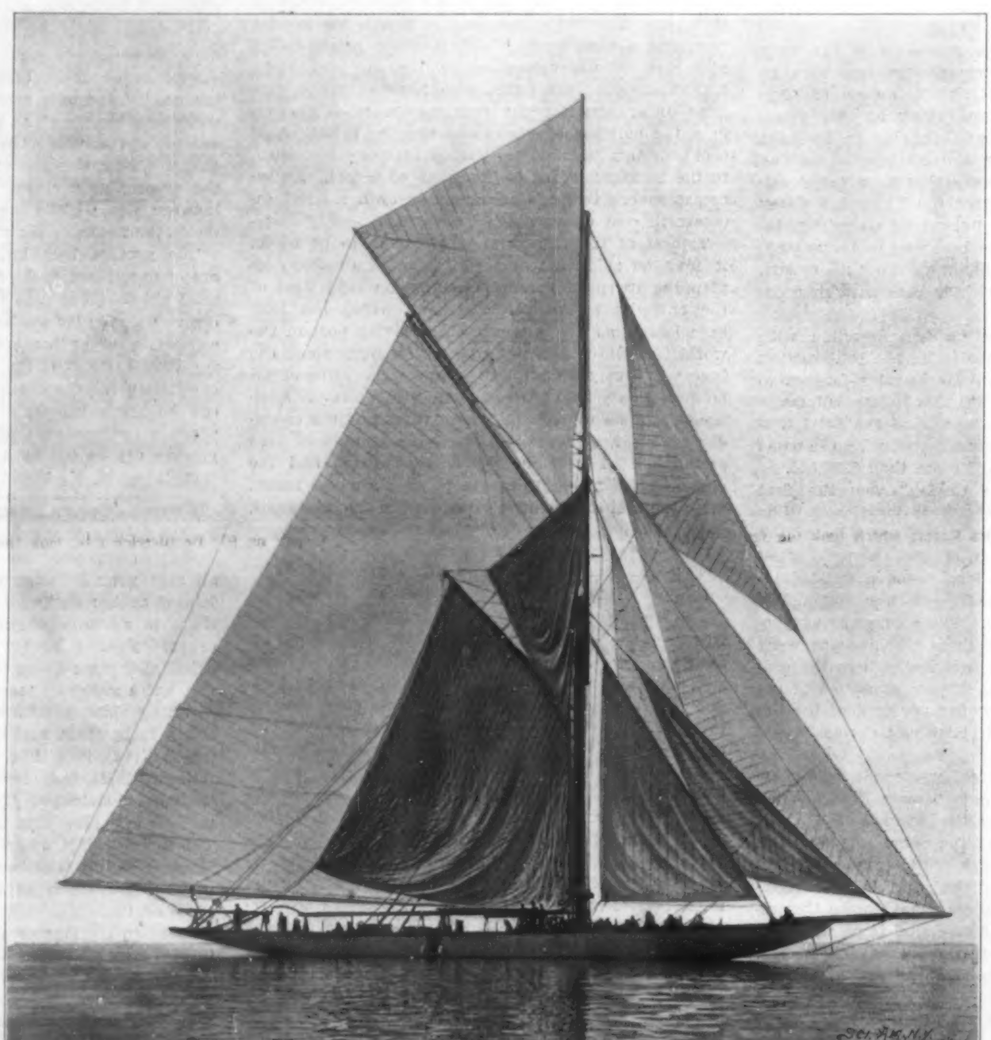
Philadelphia, May 16, 1903. C. B. HATFIELD.

THE ATLANTIC OCEAN AND THE "AMERICA" CUP.

The accompanying composite picture showing the new challenger for the "America" cup, "Shamrock III.," under both her cruising ocean rig and her racing rig of 14,500 square feet, naturally suggests the question as to whether the intervening three thousand miles of ocean water between England and America has been anything of a handicap to the challengers in their long half-century of plucky struggle to recover the cup—as many people assert that it has—or whether this supposed handicap is one of the many fictions associated with international cup racing which will not down, but present themselves with persistent regularity at every successive series of contests.

The theory is that the challenging yacht has to be built of sufficient strength to stand the stress of the heavy gales which she is liable to encounter in crossing to this side of the water; and that to give her this margin of strength she must necessarily be built of somewhat heavier scantling, and her plating must be of greater thickness, than is necessary in the case of the home yacht, which is nursed in the sheltered waters of Long Island Sound, and is at all times carefully tied by leading strings to its home cradle at the Bristol yard. Is there anything in all this? Candidly we have to confess that we think the handicap does not amount to much; possibly just enough to constitute the few minutes' handicap that means the difference in these days between winning and losing the series of races. The turbulent Atlantic Ocean puts a limit upon lightness of construction; it also puts a limit on exaggerations of form, for it is certain that no yacht of the scow type like "Independence" would risk the ocean passage. We have all heard how her bow plates were started, as she was being towed in half a gale round Point Judith, when the boat was in such a bad way that the question of abandoning her was raised. How "Reliance" would fare under similar conditions is one of the questions that all of us who are watching the defense of the cup are asking with more or less anxiety. It was hoped that the trials off Sandy Hook would have furnished the desired test of her broad, flat bow, which, while not so flat as that of "Independence," is still of such a very pronounced scow-type that as she is swinging round from tack to tack in a hammer to windward, the impact of the seas will be extremely heavy and will prove a severe tax upon the light framing and plating in the region of the waterline. It was noticeable when the yacht was hauled out at City Island that a large number of the rivets under the bow, and the butt joints of the plating, were clearly defined by circles and lines of red rust. Now, since the plating and the rivets are of bronze, the rust could not have come from them, but must have worked through from the nickel-steel frames on the inside of the hull. It could only have come from the frames by virtue of the fact that the whole structure was "working" sufficiently to allow the salt water to seep through at the rivets.

Now, "Reliance" has never experienced anything stronger than a fresh summer breeze; and if her hull is working under these conditions it becomes an interesting question as to what will happen when that tremendous sail plan is driving her at full pressure into a heavy sea off Sandy Hook. This condition, however, may never occur, and the great boat may be favored with those moderate winds and seas under which she would seem, on her showing so far, to be perfectly certain of defeating her coming antagonist. At the same time the interesting question is raised as to whether a boat of this extreme type and exaggerated rig would safely make the westward passage. We think not. On the other hand, it is claimed, with much reason, that the strains to which a vessel is subjected when she is being driven to the utmost under her towering stress of racing canvas are fully as great as any that she may meet when jogging along in a gale of wind under snug cruising canvas. Probably in a thrash to windward, such as occurred in the famous race between "Vigilant" and "Valkyrie II.," the hulls are about as severely tested as they would be if hove to in an Atlantic gale. On the whole, however, it is probable that yachtsmen, and those who go down to the sea in ships generally, will be agreed that the three thousand miles stretch of the stormy Atlantic will always prove to be a very real handicap to the challenger, especially if the passage must be made from east to west against the prevailing winds.



"SHAMROCK III." IN HER OCEAN AND RACING RIGS.

THE PARIS-MADRID AUTOMOBILE RACE.

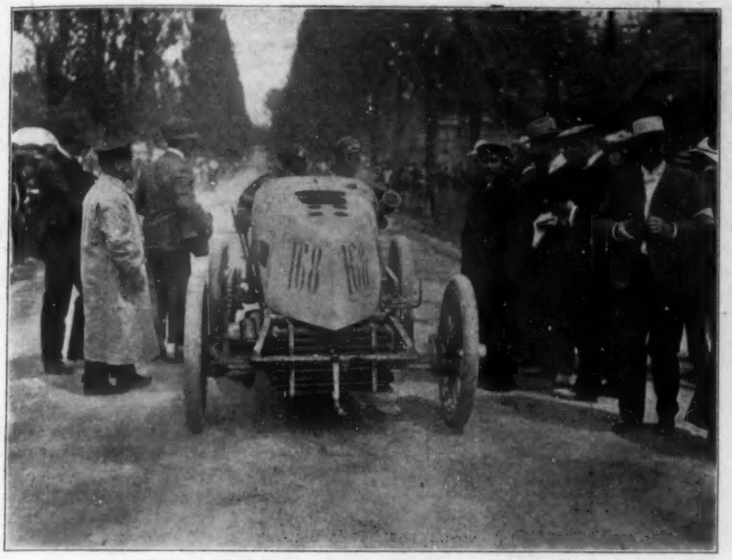
SPECIALLY PREPARED FOR THE SCIENTIFIC AMERICAN BY OUR PARIS CORRESPONDENT.

The Paris-Madrid race, which was held on the 24th of May, has certainly been a unique event in the history of the automobile. Never before has there been shown a greater interest on the part of the public in an automobile race, and it is estimated that at least two million persons were ranged along the route at different points between Paris and Bordeaux. The event is also remarkable for the high power and great speed of the new machines, some of which undoubtedly reached 80 miles an hour. The race led off in the most brilliant manner, having no less than 228 starters, but after the finish of the Bordeaux stage, which occupied the first day, the news came of a number of serious accidents, including the death of Marcel Renault, and the race was not allowed to proceed further. As it is, however, it has been a great event and one which will long be remembered.

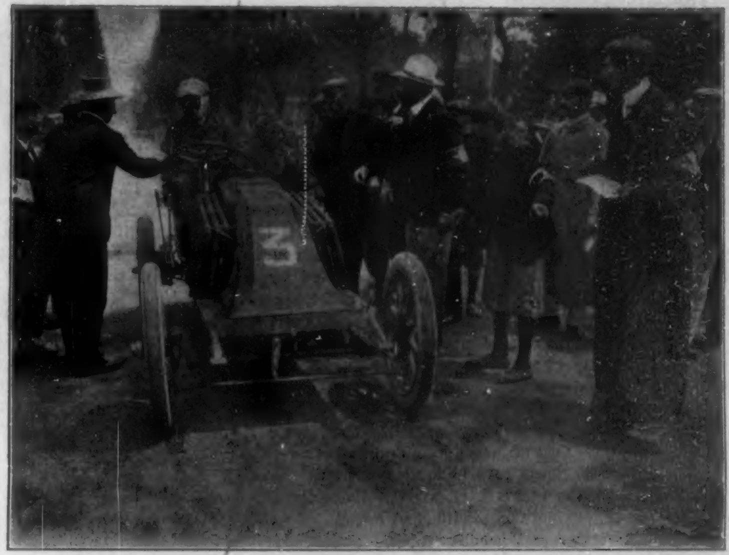
The Mors machines have the form of an upturned boat, or a torpedo shape with sharply pointed front, which gives them a handsome appearance. The wheels are spread wide apart, and the radiator is placed between the front wheels and underneath the body of the car. The four-cylinder motor gives 80 or 90 horse power, with mechanically operated valves and magneto ignition. The Mors racers have a transmission which allows four speeds, with direct driving at the high speed. The rear wheels are driven by chain gearing. The driver's seat is placed far in the rear, and the chauffeurs are thus almost entirely concealed behind the tapering front and offer but little resistance to the air. These cars were especially remarked for their handsome lines. They have a stable and solid appearance, mainly due to the wide spacing of the wheels and the low position of the body, which rests near the ground. Among the conductors of the Mors cars were Fournier, Gabriel, Augieres, W. K. Vanderbilt, Jr., and others, some of whom are of the first class and have made many records, while the remainder are very close to them in skill and *sang froid*. Vanderbilt and his white car attracted a great deal of attention, as he was one of the few Americans to enter the race. The Panhard & Levassor cars were also among the most prominent. They have not changed much in form since last year, but have been considerably improved; the motor is of the same size as that used in the Paris-Vienna race, but can now furnish 70 horse power. The cylinders are of steel, surrounded by copper water jackets. The inlet valves are now operated mechanically, and another improvement is a new type of carbureter, besides a larger flywheel on the motor. The chassis is built of pressed steel. This year's type is remarkable for the unusual position of the motor, which is inclined toward the front at a considerable angle. This has been done in order to lower the center of gravity as much as possible and at the same time use a flywheel of large diameter, to give greater weight. So it was decided to tilt the motor toward the front, thus lowering one end while the rear end carrying the flywheel is higher up. The seats are placed near the middle. The crank case, of square form and sloping toward the front, is terminated by the radiator, which has a ventilating fan placed behind it. The Panhard cars were mounted by a number of first-class conductors, René de Knyff, Henri and Maurice Farman, and Baron de Crawhez, who have distinguished themselves in preceding years, besides Heath, Rolls, Teste, and others not far behind them.

The two favorites among the French racing cars were closely rivaled in interest by the German Mercedes car, and the Daimler Company made a special effort this year to construct a machine of great power and high speed. Although the Mercedes machines have a high reputation in general, it is only this year that a racing car properly so-called has made its appearance. Last year although not so powerful as their competitors, some of these machines were much more solidly built, and owing to the breakdown of their competitors came very near winning the Paris-Vienna race with Zborowski and De Forest at the wheel.

Great attention was therefore attracted by the new 60 and 90 horse power Mercedes cars which arrived from Canstatt a few days before the race. These two types are the same in size, differing only in the motor. The 90-horse power cars are among the most powerful machines yet built. They have a somewhat square appearance and the seat is far in the rear, just over the axle. The four-cylinder motor represents all the newest ideas, and among other points has a double inlet valve which is mechanically operated. The motor is protected by the long box front, which is terminated by the honeycomb radiator that this firm were the first to introduce, with its air-fan behind it. The body lies very low, and the wheels have a remarkable spread. The Mercedes cars were mounted by Werner, Baron de Caters, Degrais, Jenatzy, Warden, Foxhall Keene, Mr. Terry, the well-known American chauffeur, and others. After the favorites comes the De Dietrich racer, which was remarked for its pointed shape. These machines are among the newest in the field, but they have already made a good record. The four-cylinder motor gives 45 horse power, which can be pushed to 60. The radiator is mounted just beyond the pointed front



Finish at Bordeaux. Arrival of Gabriel, the Winner.

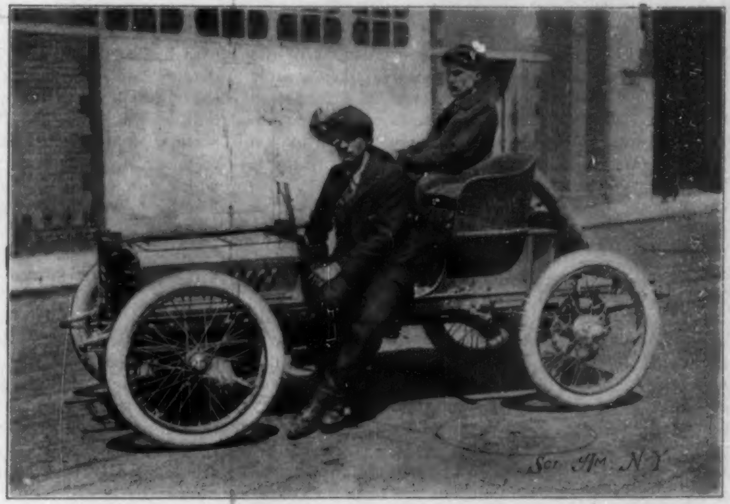


Congratulating Louis Renault, who was the First to arrive at Bordeaux, making the best time after Gabriel, and winning the Light Car Class.

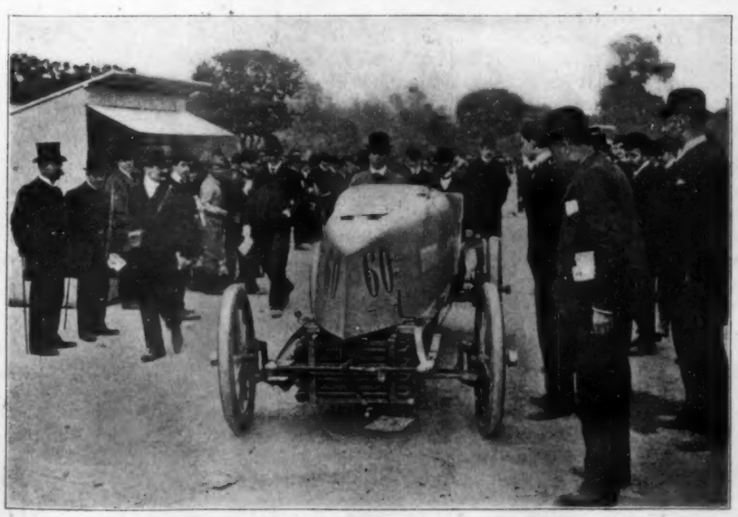
Salleron Mors Racer, which took the Third Place.

Jarrott on His De Dietrich Car, took the Fourth Place.

The Remnants of Mr. Terry's Machine.



Masson and His Clement Machine, Winner in the Voiturette Class.



W. K. Vanderbilt, Jr., on His 80 H. P. Mors.

The Wreck of Marcel Renault's Car. The Vehicle is Turned Completely Around, so that the Wreck Faces Paris. M. Renault was killed.

THE FATAL RACE FROM PARIS TO MADRID.

of the car. Among the drivers were Lorraine Barrow, Stead, Jarrott—who won the Ardennes Circuit race last year—Gras, and others. Madame Du Gast, who had the remarkable courage to enter the high-speed race, having already distinguished herself on other occasions, was greatly remarked with her long pointed racing car. The Charron, Girardot & Voigt racer has the same general appearance as last year's type with a long box front ending in a radiator. One of this year's improvements is a newly designed gear-box with direct transmission at the highest speed. Charron, with his two associates, who each mounted a car, were of course among the favorites. Alcohol was represented by a 110-horse power car of the Gobron-Brillié make, which was no doubt the most powerful in the race, but did not succeed in taking a good place. The motor has four cylinders, with two pistons per cylinder working in opposite directions. Steam was championed by the Serpollet and Chaboche cars, and of the former two new types were completed just before the race. Two of these machines give 20 horse power and the other two 40 horse power. These cars have somewhat the same construction as the racers used at Nice this year, but the exterior is considerably modified. The pointed front contains the water and gasoline tanks; the motor is placed in the center of the chassis and the boiler is now quite in the rear. Among the light-weight cars the Renault attracted the most attention as the winners of the Paris-Vienna race last year. These machines keep about the same design as before, with their triple-radiator mounted on each side of the pointed front. Marcel Renault and his brother Louis each mounted a machine. Another favorite was the Darracq light car, and this year's type is of low and square form, with a box front terminated by a radiator and containing a 4-cylinder, 30-horse power motor.

The start took place from Versailles shortly after 3 o'clock A. M., on the 24th of May, and no less than 200,000 persons left Paris during the night to reach the town or some point farther along the road. The continuous procession of cyclists in innumerable file, each carrying a Chinese lantern, together with the automobiles, nearly all of which had turned out naturally to see the event, gave a festive air to the occurrence. It was intended to run the first stage to Bordeaux that day, or 331.2 miles, the next to Vittoria, 127.2 miles, and the last to Madrid, 325.8 miles, making a total of 784.2 miles. Over 50 tourists had left Paris a few days before on their way to Madrid to see the finish as well as to test the endurance of their machines.

The machines were started one after the other in the order of their inscription, which had therefore no particular significance, as it was only the time occupied in making the run that counted. However, many of the leading champions had the first numbers. Shortly after 3 o'clock all was ready for the start, the road was cleared and the competitors were drawn up in file awaiting their turn. First in order came Jarrott on his De Dietrich car. At the signal given by the timekeeper, Jarrott came up to the line with his formidable machine ready to start. But it was still too dark to see the road plainly and so it was decided to wait a quarter of an hour longer for better light. After Jarrott came Réné de Knyff on his Panhard, then Louis Renault in his light car, and not far behind was Fournier, mounted on a Mors racer, then the long file of competitors. At 3:45 the signal for the start was given and Jarrott led off with a tremendous rush, disappearing in a cloud of dust. The other cars followed at intervals of one minute, and there were as many as 139 starters in the heavy and light weight classes. After these had all passed came the turn of the voiturettes, which were 36 in number, followed by 53 motor-bicycles which were started two by two in order to gain time. The greater number of spectators had left Versailles in order to see the cars pass at full speed, choosing the best places for watching the racers, some taking their position by a long stretch of road, others preferring the excitement of seeing the cars round a sharp turn at full speed. One of the best points lay at the foot of a long slope of good road between Versailles and Chartres, where the machines could be seen approaching from the top of the hill almost like specks in the distance, coming down with a terrific rush and passing at lightning speed. The sight was most impressive, and such high speeds have never before been attained under similar conditions. Unfortunately it will no doubt be a long time before such a performance is seen again in France.

Renault was the first to arrive at Bordeaux, at 12:14:0, followed by Jarrott, Gabriel, Salleron, Baras, Baron de Crawhez, etc. The race was won by Gabriel, who covered the distance in 5 h. 13 m. 31 s. Renault took second place in 5 h. 39 m. 59 s., which was a considerable surprise, as it was not expected that a light weight car would gain over so many of the more powerful racers.

The following is the official time of the winners, deducting for certain parts of the route where high speed could not be made, as in some towns and villages, which were not counted in the race. 1. Gabriel on a *Mors* car, time 5 h. 13 m. 31 s. 2. Louis Renault, *Renault* light car, time 5 h. 39 m. 59 s. 3. Salleron, *Mors* car, 5 h. 46 m. 0 1-5 s. 4. Jarrott, *De Dietrich* car, 5 h. 51 m. 55 s. 5. Warden, *Mercedes* car, 5 h. 56 m. 30 4-5 s. 6. De Crawhez, *Panhard* car, 6 h. 1 m. 8 2-5 s. 7. Voigt, *Charron, Girardot & Voigt* car, 6 h. 1 m. 9 1-5 s. 8. Gasteaux, *Mercedes* car, 6 h. 8 m. 0 s. 9. Ach. Fournier, *Mors* car, 6 h. 11 m. 39 s. 10. Baras, *Darracq* light car, 6 h. 12 m. 49 s. 11. Rougier, *De Dietrich* car, 6 h. 16 m. 7 4-5 s. 12. Moutier, *De Dietrich* car, 6 h. 17 m. 54 1-5 s., etc.

In the different classes, heavy cars, light cars, voiturettes and motocycles, the order is as follows: For the heavy cars the order is the same as above, leaving out No. 2 (Renault light car) and No. 10 (Darracq light car). For the light weight class the winners are: 1. L. Renault, *Renault* car, 5 h. 39 m. 59 s. 2. Baras, *Darracq* car, 6 h. 12 m. 49 s. 3. Page, *Decauville* car, 6 h. 19 m. 8 1-5 s. 4. Hemery, *Darracq* car, 6 h. 52 m. 33 1-5 s. 5. Pellésson, *De Dion* car, 7 h. 12 m. 43 1-5 s. 6. Théry, *Decauville* car, 7 h. 13 m. 16 s. 7. Edmond, *Darracq* car, 8 h. 0 m. 34 1-5 s. 8. Sincholle, *Darracq* car, 8 h. 4 m. 7 2-5 s. 9. Osmont, *Darracq* car, 8 h. 29 m. 40 2-5 s. 10. Bardin, *De Dion* car, 8 h. 30 m. 13 3-5 s., etc. The winners in the voiturette class are: 1. Masson (*Clement voiturette*), 7 h. 19 m. 57 1-5 s. 2. Barillier (*Geo. Richard*), 7 h. 39 m. 0 3-5 s. 3. Wagner (*Darracq*), 7 h. 47 m. 12 1-5 s. 4. Combier (*Geo. Richard*), 8 h. 7 m. 26 1-5 s. 5. Holley (*De Dion*), 8 h. 22 m. 19 s., etc. For the motor bicycles the order is as follows: 1. Bucquet (*Werner*), 8 h. 57 m. 1 s. 2. Demester (*Griffon*), 9 h. 3 m. 44 s. 3. Jollivet (*Griffon*), 9 h. 25 m. 54 2-5 s. 4. Cissac (*Peugeot*), 9 h. 39 m. 36 s. 5. Lanfranchi (*Peugeot*), 9 h. 50 m. 40 s., etc.

The first honor therefore falls to Gabriel with his Mors racer, and our engraving shows the winner as he crosses the line at the finish. Louis Renault, with the light-weight Renault car, confirms the victory of this type in the Paris-Vienna race, making the second best time, and the photograph shows him as he arrives at Bordeaux. The Renault car thus takes the first place in the light-weight class. The Mors racers also carry off third place with Salleron, which gives them a decided victory, even though some of their best drivers were not able to finish. Henri Fournier and Augières both had accidents *en route*, but were fortunately not injured, while Vanderbilt could not finish on account of a punctured tire. The Mors cars also took ninth place with Achille Fournier. The De Dietrich wins its laurels against the older machines, taking fourth place with Jarrott, while the Mercedes, although they certainly made a high speed on the road, did not come up to the general expectation, and only reached fifth place with Warden. The Panhard cars had still worse luck, as most of their best conductors had been disabled on the road owing to accidents, the Farman brothers and Réné de Knyff being *hors de combat*. The Panhard cars thus take sixth place with Baron de Crawhez. Another new machine to take a good place is the Charron, Girardot & Voigt, which now shows that it must be counted among the leading types, as it reached seventh place, mounted by Voigt. One of the Mercedes cars took eighth place, then came a Mors, followed by a Darracq light-weight car, which thus gained over the majority of heavy-weights. Most of the above mentioned machines are illustrated in the current issue of the Supplement, where a more detailed description of the various cars and the race itself will be found.

In the light-weight class Renault comes first in order, then the Darracq, both these cars making a good record. Then comes a Decauville, with another Darracq, and fifth a De Dion-Bouton. The voiturettes are led by Clement, followed by Geo. Richard and Darracq. Only eight motor-bicycles were able to finish. A Werner takes first place, mounted by Bucquet, followed by two of the Griffon type and two Peugeots.

As to speed, the results of the race were a surprise to all. It was expected that in view of the recent records which have been made on the road, the distance from Versailles to Bordeaux, or 331 miles, would be covered this year in 5½ hours, which would be a remarkable performance, since the Southern Express takes 7 hours to make the distance. But in fact the winner, Gabriel, covered the ground in 5 hours 13 minutes, which represents an average speed of 63.45 miles an hour, and this was kept up over bad stretches of road, over drains and crossings and the numerous obstacles which were encountered. As to the highest speeds which were made by the new cars, there is little doubt that many of them ran as high as 70 or 80 miles an hour over parts of the road, and it is probable that never before have such high speeds been attained by automobiles.

It is to be regretted that this splendid performance was marked by a number of accidents, both to the chauffeurs and the spectators of the race, and some of these were of such a grave character that the authorities were obliged to stop the race at Bordeaux, fearing that further damage would be done along the remainder of the route. The most painful accident was that of Marcel Renault, which resulted in the death of this well-known chauffeur and winner of the Paris-Vienna race. It appears that Renault was following close behind Théry, not far from Bordeaux, and waited for the most favorable moment to pass him. At this point were two turns in the road which are rather dangerous. In trying to pass Théry, Renault kept up full speed, but made too wide a turn and one of the wheels caught in a ditch at the side of the road and broke off short. The car went head down and turned completely over. Renault was thrown head first against a tree and had his skull fractured. He remained unconscious for some time and his recovery was hoped for, but he did not survive. The death of Renault is the most regrettable accident of the race, and has been deeply felt by those who esteemed him for his skill as well as his personal qualities. His machinist was also severely wounded. Lorraine Barrow had a serious accident shortly after leaving Libourne. While going at full speed a dog ran under the wheels, causing the car to make a terrible swing to the right, running it into a tree while at a speed of 60 miles an hour. The machinist, Pierre Rodez, was thrown against the tree and instantly killed. Lorraine Barrow was found in an unconscious state and sustained various injuries, but at last reports it is thought he will recover. Near Montguyon, Mr. Stead, who piloted a De Dietrich car, tried to pass another racer in front of him and a collision took place. Stead was thrown out, and although injured, is expected to recover within a short time. Madame Du Gast, after having passed among the first, stopped for nearly two hours to look after Mr. Stead and was thus considerably behind in the race. The machinist was killed outright. A number of accidents are reported among the spectators. A soldier named Dupuy and several others were killed. M. Georges Richard, the well-known automobile constructor, while conducting a racing car, ran into a donkey-cart and was thrown from his machine, but is only slightly injured. The car piloted by Mr. Terry, the American chauffeur, had a collision with a competitor and was completely burned, as the gasoline reservoir took fire. Details of this disaster are given in the current issue of the Supplement.

Owing to the numerous accidents, the authorities refused to allow the race to proceed further than Bordeaux.

SOME EXPERIMENTS WITH ACTINIC LIGHT.

BY J. W. KIME, M.D.

The light of the sun is composed of three distinct kinds of rays, luminous, heat, and chemical or actinic rays.

The visible solar spectrum extends from the red, having a wave length of about 0.76 micron, to the violet, having a wave length of about 0.40 micron. The ultra-red rays have a greater wave length, and the ultra-violet shorter wave length than those which lie within the visible bands of the spectrum. The chemical waves of light, with which we are chiefly concerned in therapy, lie principally in the blue bands of the spectrum, and have a wave length of about 0.49 micron to about 0.40 micron.

Since it is actinic light that produces the chemical changes in the silver salts in the sensitized plates and papers used in photography, we may thus readily ascertain those bands in the solar spectrum which are rich and those that are poor in the rays which we desire to isolate and utilize in the treatment of disease.

With this object in view, and with the able assistance of a photographer, Mr. G. L. Hostetler, the following experiments were made:

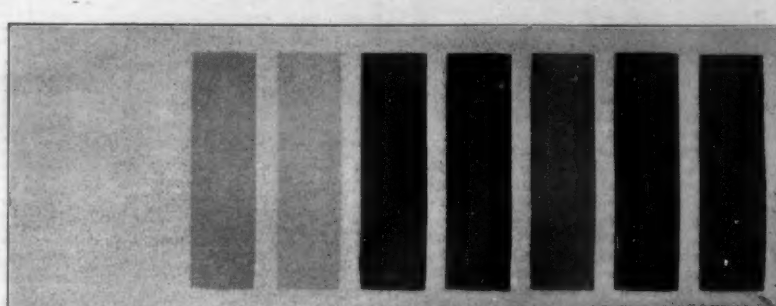
Experiment No. 1.—Strips of glass corresponding in color to the various colors of the solar spectrum were arranged as follows: Red, orange, yellow, green, blue, indigo, violet, open space, plain glass. These strips were fixed in a frame and were bound to a sensitized plate, after which they were exposed, almost instantaneously, to very weak, diffused daylight, which entered the dark-room without passing through glass. In this manner we obtained a true photograph of actinic light through open space, plain glass, and through glass of various colors.

Fig. 1 shows this result. We take the open space, in which no glass intervened between the light and the sensitized plate, as representing 100 per cent of the actinic light which reached the plate. Comparing this with that admitted through plain glass and through blue glass, we are unable to recognize any difference whatever between the open space and blue glass, while the plain glass is a shade darker, showing that less actinic light passed through it than through either of the other two.

From this photograph it will be seen that blue glass cuts off no chemical light, and consequently that the ultra-violet rays are either not markedly actinic or that the blue glass does not retard their passage. It is very evident that 100 per cent of actinic light has reached the plate through the blue glass. Why the plain glass, which was perfectly transparent and of the same character as the imported photographic plates should be less translucent to the chemical rays than the blue glass I am unable to say, and I present the photograph

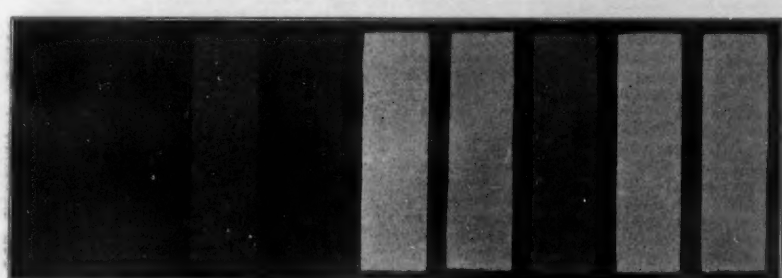
as the best evidence that the facts are as stated. Beginning at the red end of the spectrum, we find that no light whatever reached the plate through the red, and no trace is apparent in the orange; the yellow transmits an appreciable amount, and the green just enough to be seen. From this point we jump from almost zero in the green to 100 per cent in the blue. Hence wave length has nothing to do with determining the chemical activity of the light. In the indigo there is a slight diminution from the blue, but there is still fully as much as traversed the plain glass. In the violet we drop back to about the same percentage as in the yellow. Here we have shorter wave length with less chemical activity. We would infer from much that has appeared in recent literature that the violet and ultra-violet rays are those in which a maximum of chemical action may be found, that the higher we go in the scale, and the shorter the wave length, the greater the actinic power; or that the violet and ultra-violet rays contained other properties than those known in the other bands of the spectrum and other than luminous, heat, or chemical rays. It is apparent from our photographs that color, independently of wave length, influences the chemical action of light. The luminous rays have no effect upon the sensitized plate; the yellow band is richest in luminous rays, but it is very poor in actinic power. The red rays are rich in heat, but they are seen to be a blank in a chemical way; orange is rich in both heat and light, but it likewise is a blank in a chemotactic sense. Green is very bright, and transmits much light, but the chemical tracing in the plate is very slight. The blue is both cold and comparatively dark, in regard to heat and light, but it is exceedingly rich in an actinic sense. The plain glass transmits 100 per cent of light, or practically so, and about the same percentage of heat, but it is seen to be a little weak in a chemical way.

Plate No. 2 is in every sense confirmatory of the conclusions drawn from plate No. 1, yet it was produced in a manner directly opposite to plate No. 1. The former is a positive, and the latter a negative.



Red. Orange. Yellow. Green. Blue. Indigo. Violet. Open Space. Clear Glass.

Fig. 1.—A TRUE PHOTOGRAPHIC REPRODUCTION OF THE EFFECT OF ACTINIC LIGHT.

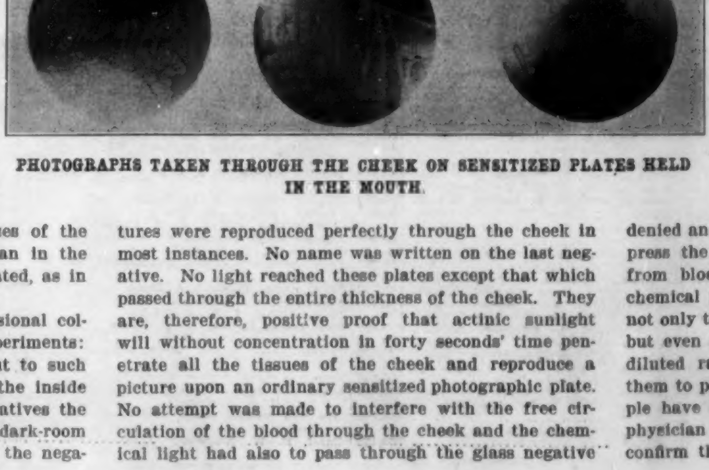


Red. Orange. Yellow. Green. Blue. Indigo. Violet. Open Space. Clear Glass.

Fig. 2.—A TRUE PHOTOGRAPH OF THE EFFECT OF ACTINIC LIGHT ON SENSITIZED PRINTING-OUT PAPER.

Experiment No. 2.—The same strips of glass were arranged precisely as for experiment No. 1. They were now, however, placed over ordinary photographic printing paper, Aristo, and were exposed to the sun until the open space was fully printed. No other glass intervened between the sensitized paper and the sun except the strips referred to. This print being made through the glass of various colors represents the proportion of actinic light transmitted.

The red and orange each cut off 100 per cent; the yellow transmits a small percentage; in the green we drop back to merely a trace, while in the blue we rise suddenly to 100 per cent; the indigo transmits a little less than the blue, while the violet drops to less than 50 per cent of the blue. The open space transmits 100 per cent of actinic light, and, so far as we are able to see here, the plain glass also transmits 100 per cent of actinic light. (I consider the actual photograph on the sensitized plate the more delicate and accurate test of the two.)



PHOTOGRAPHS TAKEN THROUGH THE CHEEK ON SENSITIZED PLATES HELD IN THE MOUTH.

In both plates 1 and 2 the violet band is shown to be poor in actinic light. Hence the so-called "violet ray," which is now so common in literature, should be dropped, and "blue ray" should be substituted in its place.

The results shown in plates 1 and 2 have been confirmed by repeatedly going over the experiments, and always with like findings.

Experiment No. 3.—Penetrability of Actinic Light.—That light may be of value in the treatment of disease, it must be made to penetrate deeply into the tissues of the body. For lupus, superficial epithelioma, and parasitic diseases of the skin, deep penetration is less necessary than in the treatment of disease that is more deeply seated, as in pulmonary tuberculosis.

With the kind co-operation of my professional colleagues I was able to make the following experiments: Small photographic glass negatives were cut to such size that they might readily be passed to the inside of the cheek. Across the face of these negatives the physicians wrote their signatures. In the dark-room sensitized plates of like size were bound to the negatives. Thus arranged the plates were put inside the mouth between the teeth and the cheek, and, with the mouth tightly closed and the nose and mouth covered with a black silk cloth, the cheek was exposed to direct sunshine on a February day for forty seconds, and perfect reproductions of the pictures and of the signatures were thus secured. In these experiments the negatives were placed on the side exposed to the sun and next to the cheek. The prints thus obtained are, of course, in reverse to the pictures on the original negatives, and are here reproduced as transparencies. I am under obligations to Drs. H. G. Ristine, W. R. Bates, A. H. McCreight, and W. Bowen and to Mr. Hostetler for assistance thus kindly rendered in this test. To make the test as rigid as possible, the same experiment was made in the same manner upon a very dark negro with a thick, black cheek. Time of exposure was the same as with the others.

The pictures arranged in their order are: J. W. Kime, bouquet of flowers; H. G. Ristine, man (negative); G. L. Hostetler, tree tops; W. Bowen, man and train of cars; W. R. Bates, boy sitting on steps; A. H. McCreight, a crowd at auction; negro, corner of porch.

Dr. McCreight has a thick, short, black beard, and the picture was taken through this as well as through the cheek. With the colored man the cutting off of the light by the pigment in the cheek was even more marked, but light still reached the plate and reproduced an imperfect picture. The other pictures are well marked, but would appear more natural were they in positives rather than in negatives. The signatures were reproduced perfectly through the cheek in most instances. No name was written on the last negative. No light reached these plates except that which passed through the entire thickness of the cheek. They are, therefore, positive proof that actinic sunlight will without concentration in forty seconds' time penetrate all the tissues of the cheek and reproduce a picture upon an ordinary sensitized photographic plate. No attempt was made to interfere with the free circulation of the blood through the cheek and the chemical light had also to pass through the glass negative to reach the sensitized plate. Since ordinary sunshine has such penetrative powers it is very evident that concentrated actinic sunlight, when concentrated as strongly as can be borne on account of the accompanying heat, penetrates the chest wall and the lung tissues to a very marked degree. That it penetrates the entire thickness of the thorax has been repeatedly shown first by the writer in 1900 and afterward by Gotthell and Franklin and Mount Blyer of New York and by Kaiser, of Vienna.

Thermometric Tests.—Sunlight was concentrated by means of a six-inch bifocal lens upon the bulb of a thermometer until the mercury rose to 168 deg. F. Strips of red, yellow, and blue glass were consecutively placed, so that the concentrated light must first pass through them before falling upon the bulb. When red or yellow was intervened, the mercury continued to rise; when blue was placed between, it fell. The difference marked was as high as 56 deg. F. Hence blue light is a very much colder light than that of any other color; and, since it is with the heat and actinic rays that we are most concerned in medicine—the heat to be eliminated in so far as it may be possible, and the chemical rays to be concentrated to the fullest extent—our experiments prove conclusively that these ends may be best attained by concentrating the rays which correspond to those found in the blue bands of the spectrum.

Passing the solar rays through blue glass excludes the heat to a marked degree, while the chemical rays are transmitted *in toto*. If these blue rays be then gathered up and concentrated either by a concave reflector or by a powerful lens, we have the richest possible light in chemical qualities and the poorest in regard to heat.

Our experiments show why red light is exceedingly valuable in the treatment of smallpox. They prove that no chemical light of any consequence reaches the patient; and since the chemical rays are irritant in their action, it is of the first importance that they be excluded.

No room in which a smallpox patient may hereafter lie should be left undraped with red cloth over every avenue through which light may be admitted. The plague of smallpox lies not so much in its mortality as in its frightful disfigurements, which, by the exclusion of chemical light, may be very materially lessened or wholly prevented. Either orange or green-colored drapings may be substituted for the red with very good results.

Finsen found that earthworms were restless under blue glass and were quiet under red; that chameleons partly under red and partly under blue glass soon changed the portion under the blue to a darker color and that under the red to a lighter color, the movable pigment being used to protect the reptile from the irritant action of the chemical rays of the blue. The red glass found in the photographer's window in the darkroom is another evidence of the nonpenetrability of red to the actinic rays. Let him change this red pane to blue, and all his plates will be instantly ruined. Orange and green glass are sometimes used instead of red in darkroom windows.

The bactericidal effect of light is limited to its chemical rays, hence the blue and violet bands of the spectrum are those only that are of value in this respect, and the blue is much the richer of the two. It has been denied that actinic light will penetrate glass—that glass of all colors is impervious to it. We have shown that blue glass is perfectly transparent to these rays.

The penetrability of the chemical rays into the tissues of the body even when concentrated to the fullest extent to a depth beyond a few millimeters has been denied and it has been held that it is necessary to compress the parts to be treated in order to free them from blood, which, being red in color, absorbs the chemical rays. We have found, on the contrary, that not only the thick tissues of the cheek filled with blood, but even the black cheek of the negro, transmits the diluted rays of ordinary sunshine and still permits them to pass through glass to reach the plate. So simple have been all the experiments detailed, that any physician with the aid of a careful photographer may confirm them.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 4279.—For makers of machinery for collapsible tubes.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4280.—For makers of rural free delivery boxes.

Morgan Emery wheels. Box 517, Stroudsburg, Pa.

Inquiry No. 4281.—For manufacturers of flintkote roofing.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 4282.—For the manufacturers of the Pictet ice machine.

Blowers and exhausters. Exeter Machine Works, Exeter, N. H.

Inquiry No. 4283.—For an upright 4 to 6 h. p. steam engine and a dynamo to run 20 to 30 lights.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 4284.—For manufacturers of counting machines.

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4285.—For dealers in turbine grist mills, saw mills, water rams, etc.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4286.—For makers of naphtha engines and launches.

Want metal novelties of any kind, any quantity? Write Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 4287.—For manufacturers of cotton yarn loops.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4288.—For manufacturers of aluminum hones for sharpening knives.

Gear Cutting of every description accurately done. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 4289.—For makers of Ferris wheels for use at fairs and summer resorts.

Crude oil burners for heating and cooking. Simple, efficient and cheap. Fully guaranteed. C. F. Jenkins Co., 1103 Harvard Street, Washington, D. C.

Inquiry No. 4290.—For makers of fans driven by spring motors.

The Honoco razor strop made of paper. The perfect strop for a perfect shave. By mail 75 cents. Send for description. Hope Novelty Co., Bristol, R. I.

Inquiry No. 4291.—For catalogues, prices and descriptions of automobiles suitable for a livery.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4292.—For makers of light, portable band sawmills.

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc. Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 4293.—For makers of plows with an elevator attachment for placing dirt into wagons.

Users of steam automobiles, send your name and address, and learn a simple way to end your boiler troubles. Address 119 West 1st Street, Oswego, N. Y.

Inquiry No. 4294.—For domestic and foreign manufacturers of inflatable rubber toys, such as balloons, etc.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 4295.—For a machine for cutting wire into lengths and winding it around a small package.

Contract manufacturers of hardware specialties, machinery, stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., Chicago.

Inquiry No. 4296.—For a steam jacketed vulcanizer for making artificial rubber limbs, etc.

High class machinery built to order at reasonable rates. Address P. O. Box 607, Baltimore, Md.

Inquiry No. 4297.—For makers of wire cushions for invalid chairs.

WANTED.—Some novelty to manufacture. Ample capital. Must be article that will meet ready sale throughout the United States. Address Box 52, Titusville, Pa.

Inquiry No. 4298.—For dealers in second-hand pool and billiard tables.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4299.—For a mechanical lawn grass (not leaf) rake.

WANTED.—To lease two 40 to 50 ton six wheel, or eight wheel or ten wheel, or Mogul locomotives. Send general dimensions and report on conditions with proposition. Georgia Iron and Coal Company, Chattanooga, Tenn.

Inquiry No. 4300.—For makers of apron springs for use of sporting men, etc.

WANTED.—Structural steel engineer who has had at least five years' experience as contracting engineer for steel company, making a specialty of structural steel for fireproof buildings. Must be experienced in designing steel, soliciting orders and closing contracts. Must be a broad gauge man, capable of directing others and managing an office. Good salary and promotion to right man. Address Engineer, Box 773, New York.

Inquiry No. 4301.—For makers of shot guns, hammer and hammerless guns, etc.

Superintendent wanted for electrical and brass novelties. Applicants must possess executive ability and a thorough knowledge of tool making and brass manufacturing in all its branches. Only men with long experience need apply. Applications to be given in writing stating age, experience, recommendations and salary expected. American Electrical Novelty and Manufacturing Company, 308 Hudson Street, New York.

Inquiry No. 4302.—For makers of hose, hose reels, cut-off nozzles, spanners, hydrant wrenches, axes, etc.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

RECENTLY PATENTED INVENTIONS.

Miscellaneous.

RAW-WOOL-WASHING APPARATUS.—A. HASS, and E. BARUCH, San Francisco, Cal. The aim of this invention is to provide an apparatus for use in local wool-growing centers, to allow of washing or cleansing raw sheep's wool and other textile fibers without the use of plants or machinery, and to remove natural greases, fats, dirt and other extraneous matter from fibers and to convert the by-products into merchantable materials.

CAMERA.—G. H. LEE, Omaha, Neb. Mr. Lee's invention is an improvement in film-cameras, and the object is the severance of the film at any desired point, when only a part of it has been exposed, and the development of the exposed part of the film and the preservation of the balance in proper position, with connections for subsequent use, the whole operation being conducted in daylight, without the use of a dark room.

The same inventor has secured another patent on a camera, wherein to provide means for preventing the accidental or inadvertent exposure of a sensitive film while the bellows is folded, but the camera-door open. It sometimes happens that careless pressure upon the shutter-working bulb will ruin an exposed film or prematurely expose a sensitive film. In the present invention an automatic shutter connected to and worked by the movement of the bellows in folding and unfolding, prevents this.

CALENDAR.—G. H. T. SCRIBNER, Emporia, Kan. Broadly stated, this invention consists in so combining calendar sheets and an advertising-card that they are permanently connected, yet advertising matter on the card is constantly displayed through an opening at the top of the calendar proper. The sheets may be turned and folded over the back of the cards at the ends of the respective months, and preserved for future reference.

LOOM HEDDLE-FRAME.—R. G. WIRTALLA, New York, N. Y. Means are provided in this case by which the adjustment, removal, and insertion of the heddles can be easily, quickly, and readily performed without hurting the operator's hands, because it is not necessary to forcibly lift the heddle-bars and strain the heddles strung thereon. This is attained by the employment of a stay-hook which is removably attached to the heddle-frame and easily slipped from engagement with the heddle-bars.

PUZZLE.—C. L. SMITH, Leipsic, Ohio. The board in this puzzle is provided with a vertical rim, and a center space with vertical walls serves as a retention pen for a series of smaller balls. Channels extend through the walls, and means are given to get the small balls into a larger one and then rolling the latter over a band into the pen and there effecting discharge of the smaller balls therefrom. To begin, all the balls may be first placed in the channels in which they are free to roll, and the smaller ones are then picked up by the larger one and carried into the inclosure.

LACE-FASTENER.—F. W. LEOPOLD, New York, N. Y. The inventor's object in view is the provision of an inexpensive contrivance for easily and quickly fastening a lace or cord by pulling or thrusting the lace or cord into the fastener, the introduction or removal of the lace being facilitated by the form given to the hook or stud embodying this invention.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

June 9, 1903,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Abrading material and mounting therefor, R. Gardner ... 730,527
Adding machine, G. F. Meier ... 730,281
Adjustable chair or table, P. C. Palmer ... 730,690
Agitating apparatus, W. H. Motter ... 730,384
Air brake coupling, automatic, C. H. Seitz ... 730,484
Air brake dust arrester, T. M. Henderson ... 730,824
Alarm system, electric, S. Schwarzschild ... 730,576
Ammunition chest, R. P. Stout ... 730,411
Animal trap, C. C. Bowen ... 730,434
Animal trap, A. D. Gaston ... 730,528
Antiseptic and deodorizing compound, H. P. Busch ... 730,231
Armature, dynamo electric machine, C. P. Steinmetz ... 730,582
Automatic gate, E. W. Easley ... 730,354
Automatically operated gate, G. McElroy ... 730,290
Automobile, G. O. Draper ... 730,352, 730,353
Automobile lock, B. D. Colby ... 730,515
Awning, H. C. Marcus ... 730,677
Banana swing, J. C. Skinner ... 730,408
Band wheel scraper, J. Tweedie ... 730,419
Barrel head fastener, H. H. Kromberg ... 730,668
Barrel washing machine, J. Muller ... 730,470
Basin, catch, M. Cullen ... 730,817
Bearing and support for universal mills, F. Selling ... 730,802
Bearing box, adjustable, O. S. Walker ... 730,808
Bearing, roller, J. Kincaid ... 730,773
Bed and couch, combined, D. T. Owen ... 730,392
Bed, folding, D. T. Owen ... 730,390, 730,393
Bedstead attachment, A. M. Hoyer ... 730,770
Belt, waterproof protected leather, L. Loeb ... 730,832
Bicycle balance, M. L. Edmunds ... 730,622
Bill holder, J. H. Parks ... 730,562
Binder, H. C. Blackmer ... 730,225
Binder, extensible post, F. W. Tobey ... 730,318
Binder, temporary, E. L. Krag ... 730,544
Binder, temporary, M. F. Wolff ... 730,727
Biscuit and doughnut cutter, combined, N. A. Oliver ... 730,792
Bobbins, cops, etc., machine for packing, D. G. Baker ... 730,442
Boiler flue, T. F. Bower ... 730,338
Boiler furnace, J. Smith ... 730,409
Bolster, T. Mitchell ... 730,283
Bolts, screws, or similar articles in soft substances, such as wood, means for fixing, J. V. E. Thiollier ... 730,585
Books, system of reference for account or other memorandum, I. B. Hendrickson ... 730,650
Boot or shoe, leather, G. E. McCormack ... 730,555
Boring tool, Sheets & Hill ... 730,709
Bottle cap, E. Norton ... 730,561
Bottle cap shaper, J. Gilbert ... 730,634
Bottle, non-refillable, C. A. Lindstrom ... 730,380
Bottle, nursing, M. Bonnefont ... 730,337
Bottle stopper, J. R. Greenaway ... 730,254
Bottles, means and device for closing, W. Wust ... 730,729
Box blank pasting and folding machine, E. G. Staude ... 730,410
Box fastener, A. Bennett ... 730,336
Brake lever, E. M. Akers ... 730,431
Brewing, H. A. Hobson ... 730,651
Brooder, O. H. Grosland ... 730,640
Brooder, poultry, J. B. Ranney ... 730,296
Brush, toilet, W. Wallach ... 730,497
Bucket, candy, A. Bell ... 730,511
Bucket, ore or dredging, R. J. Mefford ... 730,280
Buckle, G. W. Moores ... 730,551
Buckle, E. M. Turner ... 730,846
Buckle, cinch, G. W. Gugler ... 730,256
Bundle loader, G. Briggs ... 730,605
Button, cuff, H. A. Libaire ... 730,277
Cable and drill tool socket, union, E. Strickland ... 730,414
Cable coupling, J. W. Cover ... 730,235
Calcimine composition and producing same, C. Adams ... 730,505
Calendar, wall, W. C. Norman ... 730,685
Camera, photographic, T. B. Mills ... 730,468
Camera support, H. W. Howe ... 730,458
Camping utensil, D. T. Abercrombie ... 730,731
Can cap, C. S. Bucklin ... 730,739
Can or container for volatile oils, liquids, etc., C. M. Goold ... 730,530
Candlestick, W. Haussermann ... 730,645
Cane fork, L. B. Lotz ... 730,669
Car and system of mounting and wiring electrical apparatus thereon, electric motor, G. Gibbs ... 730,251
Car door fastening, E. A. Gauchet ... 730,758
Car fender, street, S. H. Barton ... 730,335
Car seat, reversible, F. Kobout ... 730,853
Car, single rail, H. H. Tunis ... 730,586
Car stake holder, railway, W. T. Edney ... 730,242
Cars or similarly propelled vehicles, safety guard for electric tram, R. S. Rurn ... 730,740
Carbureter, D. J. Esser ... 730,627
Carbureter, explosive engine, C. A. Hedstrom ... 730,649
Carbureting device for internal combustion engines, A. P. Brush ... 730,608
Carpenter's tool, combination, W. Potter ... 730,568
Carpet fastener, J. O. Dedman et al ... 730,240
Case. See Show case.
Casing or tubing elevator, K. Chickering ... 730,233
Casing water packer, C. Haas ... 730,257
Casting apparatus, ingot, H. W. Lash ... 730,274
Cattle guard, J. W. Bireley ... 730,224
Ceiling switch, H. R. Sargent ... 730,573
Cement, manufacture of white, O. Friz ... 730,630
Chalk holder, F. A. Daniels ... 730,237
Check book, J. H. Allison ... 730,592
Chimney flue cleaner, J. A. Stine ... 730,717
Chromatrope, G. Wells ... 730,501
Churn motor, manual, T. D. A. Faubion ... 730,752
Cigar bunches by expansion, forming, S. S. Williamson ... 730,324
Cigar cutter, J. W. Field ... 730,818
Cigars, machine for simultaneously cutting and branding, I. W. Heysinger ... 730,264
Cinch plate, A. P. Weeks ... 730,321
Clasp for garters or the like, C. M. Simpson ... 730,710
Clinometer, Stallsmith & Beard ... 730,579
Clock, W. S. Scales ... 730,302
Clock, watchman's, A. E. Waggoner ... 730,420
Clothes drier, C. H. Macklin ... 730,675
Clothes hanger, E. H. Lunan ... 730,546
Clothes pounder, N. B. Bacon ... 730,811
Clutch, Weimar & Smurr ... 730,724
Clutch, friction, R. C. Hills ... 730,372
Clutch, friction, A. L. Stanford ... 730,580
Clutch, friction, A. Herisson ... 730,767
Clutch, magnetic, A. C. Eastwood ... 730,621
Coal, etc., machine for conveying, trimming, and transferring, J. McBride, Sr. ... 730,554
Coffee pot, M. C. Crawley ... 730,747
Coin operated lock, S. R. Parkes ... 730,691
Column glued joint, turned, J. Neill ... 730,789
Combing machine drawing motion, cotton, J. Slater ... 730,711
Compasses, G. Oberbeck ... 730,388
Composing board in form of a galley for storing up composing columns, O. Friese ... 730,526
Composite tube, R. W. Traylor ... 730,845
Compressing system, C. W. Vollmann ... 730,495
Concentrating table slimer attachment, C. T. Arkins ... 730,732
Condiment holder, H. B. Beach ... 730,510
Confectioner's table and melter, G. F. Dickson ... 730,748
Continuous kiln, W. P. Grath ... 730,820
Controller apparatus, Barrett & Durkin ... 730,334
Conveyer, J. Fern ... 730,448
Conveyer, S. F. Joor ... 730,539 to 730,541
Cooker, electric, E. E. Gold ... 730,252
Cooler, C. F. Conover ... 730,612
Copper, nickel, or zinc ores containing precious metals, ammonia cyanid process of treating, D. Mosher ... 730,835
Copy holder, K. R. Williams ... 730,426
Corn sheller, F. C. Patten ... 730,563
Cotton cleaner, E. B. Ham ... 730,763
Cotton compress, P. K. Crowell ... 730,347
Cotton picking sack or receptacle, L. J. & C. W. Wilson ... 730,325
Coupling, G. Krebs ... 730,777
Crib, infant's, T. H. Churchill ... 730,514
Crusher and pulverizer, M. J. Williams ... 730,503
Crutch, H. Maass ... 730,466
Cuff, sleeve, J. B. Potter ... 730,697
Cultivator weed destroying attachment, O. C. Pennington ... 730,394
Current motor, alternating, A. J. Churchward ... 730,343
Current rotary converter, constant, R. Fleming ... 730,629
Currents, generating alternating, A. D. Lunt ... 730,673
Curtain, E. H. Duchemin ... 730,440 to 730,443
Curtain pole bracket and shade holder, C. P. Searles & J. R. Greenaway ... 730,304
Curtain roller, E. H. Duchemin ... 730,444
Cutter. See Cigar cutter.
Cutting and countersinking tool, combined, A. E. J. Luckhurst ... 730,670
Dental bite taker, D. T. Huber ... 730,658
Dental engines, circuit controller for surgico, J. S. Letord et al ... 730,379
Dentist's or physician's pneumatic apparatus, Stebley & Hulings ... 730,714
Disinfectant graduator, J. H. Venners ... 730,494
Disinfecting or fire extinguishing purposes, water directing appliance for, A. Verschuren ... 730,723
Display cabinet, C. J. & R. T. Van Valkenburg ... 730,493
Display cabinet, J. L. Tandy ... 730,718
Display rack, E. B. Weston ... 730,322
Display rack, carpet, J. H. Davis ... 730,239
Display stand, jewelry, W. J. Drain, Jr. ... 730,619
Door check, F. H. Ogden ... 730,686
Door check and closer, combination, W. H. Taylor ... 730,417
Door, grain, Isaacson & Evans ... 730,461
Door lock, C. Ashmusen ... 730,593
Door, sliding, I. E. McCracken ... 730,289
Door track, sliding, H. C. Smith ... 730,712
Drying apparatus, vacuum, W. C. Perkins ... 730,564
Drying press, steam, W. E. Wines ... 730,326
Drilling tool, T. Murphy ... 730,786
Drip pan signal device, V. Ayotte, Jr. ... 730,733
Drum and fuel economizer, combined heating, S. J. McDonald ... 730,386
Dye and making same, yellow acridin, K. Jedlicka ... 730,771
Easel, E. W. Kingsbury ... 730,774
Electric circuit breaker, R. H. Read ... 730,704
Electric circuit repeating break, Daft & Williams ... 730,236
Electric machines, mechanical ventilation of, A. C. E. Rateau ... 730,401
Electric meter, E. Hartmann ... 730,262
Electric motor controller, J. B. Linn ... 730,667
Electric motors, controlling, J. W. Kellogg ... 730,376
Electric protective system, J. Weatherby, Jr. ... 730,422
Electric sparker, D. Hanauer ... 730,259
Electric time switch, H. J. Cogswell ... 730,234
Electrical conductor, flexible, Van Gilder & Post ... 730,847
Electrical rosette cut out, C. D. Platt ... 730,696
Electrically controlled lock, J. Corbett ... 730,346
Embroidery goods holder, W. N. Houden ... 730,827
Embroidery goods, means for holding, W. N. Houden ... 730,826
Engine reversing gear, gas, M. H. Neff ... 730,683
Excavating apparatus, J. G. Bump ... 730,228
Excavating apparatus, G. McKay ... 730,558
Exercising machine, M. B. Ryan ... 730,477
Explosion engine, M. Pivert ... 730,695
Explosives, manufacturing safety, A. McCracken ... 730,288
Extension table, G. Palladino ... 730,473
Extension table, G. H. Wood ... 730,850
Eyeglass bow spring, I. Fox ... 730,450
Eyeglass holder, M. A. Jordan ... 730,663
Eyeglasses, C. F. Ingold ... 730,459
Eyeglasses, G. A. Stiles ... 730,716
Fan attachment, B. Klein ... 730,271
Fan, automatic, D. C. Beltz ... 730,736
Farm gate, E. Graham ... 730,365
Fastening attachment, W. G. Rasch ... 730,400
Faucet, F. H. Havekotte ... 730,646
Feed pan bracket, G. G. Jones ... 730,374
Feed, steam boiler, G. W. MacDougall ... 730,547
Feed water heater, W. Irving ... 730,660
Feed water heater and condenser, H. C. Moore ... 730,285
Feeding mechanism, J. Boylan ... 730,602
Feeding regulator, steam boiler automatic, Ladislaw & Sgal ... 730,465
Feet, support for weak or deformed, P. J. M. Gunthorp ... 730,366
Fence building implement, wire, E. F. Hall ... 730,641
Fence stay, wire, C. H. Senour ... 730,406
Fiber cleaning machine, M. Prieto ... 730,701
File, newspaper, F. R. Richards ... 730,297
Filter, V. A. Emond ... 730,356
Filter, disk, E. Simoneton ... 730,485
Filter press, C. Kolb ... 730,776
Filtering system, F. A. W. Davis ... 730,518
Firearm, recoil, J. T. S. Schoubse ... 730,801
Fire escape, C. J. Peterson ... 730,839
Fire extinguisher, chemical, A. C. Badger ... 730,333
Fireplace appliance, open, W. P. Richardson ... 730,798
Fish trap, Haynie & Hall ... 730,6?7
Fishing reel drag, H. W. Howe ... 730,457
Floor construction, A. De Man ... 730,616
Floor dressing machine, C. B. Wattles ... 730,499
Fly screen, A. E. Walter ... 730,809
Foot arch supporter, electric, F. B. Lee ... 730,545
Forge, R. Goize ... 730,761
Fruit grader, R. Strain ... 730,412
Furnace charging apparatus, blast, E. G. Rust ... 730,799
Furnace reversing valve, J. W. Seigh ... 730,708
Furniture, adjustable, R. P. Elliott ... 730,623
Fuse, electric circuit inclosed, W. S. Atkinson ... 730,594
Gage, S. D. Shriver ... 730,407
Galvanic battery, J. R. Lord ... 730,833
Game apparatus, B. Hurd ... 730,659
Game board, C. J. Dorsey ... 730,351
Game board, H. H. Rolfe ... 730,571
Game board, C. J. Dorsey ... 730,749
Garment and watch chain support, J. V. Pilcher ... 730,566
Garment clasp, G. E. Hawes ... 730,534
Garment hanger, J. S. Heaton ... 730,263
Garment supporter, C. A. Williams ... 730,726
Garment supporter clasp, B. F. Orewiler ... 730,389
Gas burner, atmospheric, F. J. Beaumont ... 730,735
Gas distributing system, Toltz & Lipschutz ... 730,807
Gas engine, two cycle, A. M. Coburn ... 730,345
Gas furnace, J. W. Keller ... 730,268
Gas generator, acetylene, H. Baumgarten ... 730,221
Gas lighting apparatus, incandescent, T. Gordon ... 730,364
Gas or oil motor, S. M. Balzer ... 730,433
Gas tap or cock, F. A. Andrews ... 730,332
Gate, Riter & Carlos ... 730,570
Gate, J. C. Zumwalt ... 730,730
Gear, variable driving, S. M. Balzer ... 730,597
Gearing, differential, H. L. Warner ... 730,421
Gearing, friction, L. Maurer ... 730,678
Gin, roller, L. L. Foss ... 730,449
Gin saw cleaner, W. D. Stanifer ... 730,803
Glass molding machine, S. Kribs ... 730,665
Glove, F. McConnell ... 730,471
Gold beater skins, drying, E. H. & M. H. Swift ... 730,314
Golf ball, A. D. Seaman ... 730,303
Governor, A. R. Dodge ... 730,350
Governor, engine, C. R. McGahey ... 730,472
Governor, pneumatic pressure, W. H. Nightingale ... 730,791
Grate bar, F. & J. F. Kernan ... 730,77?
Grinding machine, cutter, B. M. W. Hanson ... 730,455
Grinding mill, C. C. Fusmer ... 730,63?
Grinding or sharpening device, I. M. Rose ... 730,706
Grinding wheels, means for truing, G. E. Metcalf ... 730,282
Ground detector, C. C. Badeau ... 730,555
Harness peg, J. B. Fladby ... 730,358
Harrow, O. K. Oppen ... 730,793
Harrow, roller, N. T. Nichols ... 730,837
Harrow tooth fastener, W. D. Whitney ... 730,725
Harvester, cane, G. D. Luce ... 730,671
Harvester, corn, D. Binns, reissue ... 12,116
Harvester reel rake attachment, C. E. Galbreath ... 730,632
Harvester truck, Pridmore & Benjamin ... 730,700
Hasp fastener, D. D. Nolley ... 730,684
Hat binding, C. E. Clark ... 730,851
Hat fastener, J. G. Closson ... 730,436
Hat pin, Munson & Cain ... 730,552
Hat pin, locking, H. E. Stevick ... 730,310
Hay loader, J. Gross ... 730,453
Hay or cotton press, R. Hamilton ... 730,642
Hay press, A. S. Dixon ... 730,437
Head rest, Stadtmuller & Mitchell ... 730,488
Head rest, G. L. Grimme ... 730,531
Heat and heat light bath, radiant, H. J. Dowsing ... 730,750
Heater attachment, G. Lund ... 730,672
Heating apparatus, J. Sosenheimer ... 730,578
Hides for robes, machine for cleaning, softening, and drying tanned, S. D. Castle ... 730,815
Hinge, G. R. Hill ... 730,265
Hoe, J. F. Green ... 730,636
Holdback hook, vehicle shaft, J. A. Donaldson ... 730,618
Horse taming or training device, G. Forsyth ... 730,360
Horseshoe, M. Schwartz ... 730,483
Hose patch, E. F. Peak ... 730,693
Hot air furnace, J. W. Hornsey ... 730,653 to 730,655
Hydraulic controlling apparatus for hydraulic machinery, Lane & Rainforth ... 730,273
Hygrometer, J. H. Gerrer ... 730,633
Implement holder, adjustable, R. Baker ... 730,509
Incubator, O. H. Grosland ... 730,639
Index, card, J. H. Rand ... 730,399
Insulator, W. G. Stroh ... 730,805
Internal combustion engine, F. G. Ericson ... 730,626
Jar, W. S. Weir ... 730,500
Jar closure, E. Goltstein ... 730,760
Journal bearing, G. A. Woodman ... 730,327, 730,328
Journal bearing, car, J. M. Hopkins ... 730,769
Keyboard operator, O. A. Wolters ... 730,504
Knob fastening, G. W. Roberts ... 730,705
Labeling machine, F. E. Wenzel ... 730,424
Lace, M. A. Cox ... 730,614
Lactose from whey, producing, A. S. Ramage ... 730,703
Ladle, molder's, W. S. Anderson ... 730,218
Lamp bulb, incandescent electric, E. L. Elliott ... 730,852
Lamp chimney cleaner, J. B. Fladby ... 730,359
Lamp, electric arc, C. E. Harthan ... 730,369
Lamp globe holder, arc, J. C. Tournier ... 730,721
Lamp hanger, arc, C. H. Shultz ... 730,844

(Continued on page 475)

(Continued on page 476.)

Railway track joint, O. F. McCully	730,586
Railways, switch especially adapted for third rails for electric, W. A. P. Willard, Jr.	730,810
Reflector, R. Fyfe	730,361
Refractory article of manufacture, S. L. Mersion	730,834
Refrigerating machine oil separator, G. T. Voorhees	730,496
Regenerative furnace, J. A. Durfee	730,620
Relay, reverse current, E. M. Hewlett	730,371
Rheostat, C. E. Harthan	730,644
Ring stamping apparatus, W. H. Ford	730,245
Rocking chair, platform, Van Slyke & Perry	730,320
Rolling mill guide, V. E. Edwards	730,244
Rotary engine, M. H. Sullivan	730,489
Rotary engine, M. E. Knight	730,543
Rotary engine, F. Jacob	730,661
Rotary engine, J. C. Monroe	730,679
Rubber or other sap yielding trees, device for grooving or tapping, F. S. Robinson	730,299
Rule and try square combined, W. T. Whiteway	730,849
Ruler attachment, H. Diffo	730,348
Saccharimeter, A. B. Lyons	730,674
Safety deposit receptacle, C. A. Lord	730,279
Sash lock, F. J. Hoyt	730,268
Sawing machine, wood, W. T. Yard	730,330
Scaffold bracket, B. B. Brown	730,606
Scale, T. W. Kirkman	730,270
Scale, vehicle, H. H. Chase	730,435
Scraper, wheeled, C. H. Sawyer	730,301
Screen, B. T. Burrowes	730,230
Screen, H. J. Coenen	730,745
Screw cap closure, H. J. S. Hall	730,367
Screw driver, L. S. Starrett	730,804
Seal, bottle, H. S. Brewington	730,812
Separator, J. T. Burr	730,229
Sewer water, extracting the residuary matters from, E. Vial	730,588
Sewing machine attachment, E. J. Fain	730,446
Sewing machine stitch forming mechanism, W. N. Parkes	730,692
Sewing machine table, folding, A. Morley	730,680
Shade hanger, W. Disney	730,241
Shade roller, W. H. O'Keefe	730,292
Shaft support, Livingstone & Bennett	730,278
Shears. See Sheep shears.	
Shed, portable folding, T. M. Laswell	730,275
Sheep shears, H. Burgon	730,609
Shingles from roofs or clapboards from walls, device for removing, G. W. Mitchell	730,781
Shoe tree, A. P. Redifer	730,475
Show case, F. Pollard	730,294
Show case, cabinet, A. Bever	730,512
Shuttle actuating mechanism, J. N. Whipple	730,848
Sign, changeable, J. N. Brady	730,603
Sign, electric, H. B. Wren	730,854
Signaling, electromagnetic wave, R. A. Fessenden	730,753
Signaling, wireless, L. de Forest	730,819
Siphon and bottle stopper, combined, J. E. Keller, Jr.	730,267
Siphon trap, J. E. Keyt	730,463
Skirt and waist adjuster, R. E. Saffold	730,478
Skirt holder, S. D. Engle	730,625
Skirt supporter, N. C. Edwards	730,751
Slicing machine, W. Horrocks	730,656
Smelting furnace, R. Campbell	730,610
Sparking mechanism, J. S. Dikeman	730,519
Speculum, nasal, O. B. Monosmith	730,284
Speed indicator, J. Richl	730,298
Spinning machine yarn guide holder, C. G. Tideman	730,492
Spraying device, J. C. Tennent	730,316
Square and protractor, combination, J. Oehrle, reissue	12,119
Stacker, straw, Hood & Bradford	730,825
Stamping presses, etc., table for relief, E. W. Savory	730,300
Station indicator, J. J. Heberle	730,648
Steam engine, H. Steven, Jr.	730,309
Steam generator, H. Friedenthal	730,248
Steam generator, W. Henry	730,766
Steel direct from iron ore, making, M. R. Conley	730,746
Stone, etc., making artificial, J. T. Saltiel	730,480
Stone, manufacture of artificial, J. T. Saltiel	730,479
Stove, F. Krux	730,464
Street sweeper, Z. Whittemore	730,502
Surgical fracture apparatus, G. E. Gorham	730,253
Suspenders, I. Fuhrman	730,249
Syringe, F. M. Baker	730,596
Syringe, hypodermic, P. J. McElroy	730,557
Syringe, rectal, H. M. Guild	730,822
Tank, N. J. Clayton, Sr.	730,344
Tape into edging, machine for threading, D. Grotta	730,255
Telegraphy, space, L. de Forest	730,246
Telegraphy, wireless, L. de Forest	730,247
Telephone exchange system, J. J. O'Connell	730,291
Telephone switchboard, W. E. McCormick	730,287
Thermostat, E. W. Comfort	730,816
Threshing machine, E. W. Flagg	730,754
Ticket, railway transfer, W. F. Ham	730,764
Tiles, slabs, etc., manufacture of, G. Kunick	730,778
Tire, pneumatic, E. B. Rayner	730,474
Tire, vehicle, W. Esty	730,628
Tire, wheel, D. E. Griffiths	730,638
Tongue support, spring, J. P. Barnes	730,598
Tool, combination, N. Newman	730,790
Tool heads to handles, means for adjustably securing, J. F. Kemp	730,542
Tool relieving machine, F. G. Echols	730,445
Tower, pleasure, M. J. Doner	730,521
Toy, F. Strauss	730,584
Track sanding mechanism, E. M. Hedley	730,536
Tramway towers, rope sheave support and adjustment for rope, B. C. Riblet	730,402
Tree protector, J. Schirra	730,575
Tripod, G. W. Lingle	730,830
Trousers, A. T. Buswell	730,741
Truck, car or other vehicle, S. Otis	730,687
Truck, rigid arch bar, A. Lipschutz	730,668
Trucks, appliance for use in coupling railway, J. T. Woods	730,728
Trunk, salesman's sample, J. O. Horsey	730,657
Truss, T. W. Booth	730,226
Tube. See Composite tube.	
Tube closure, A. L. Lambert	730,378
Tubing, clamp for removing, J. H. Smith	730,486
Tubing top, M. J. Kirschner	730,664
Tuft fastener, D. P. Page	730,689
Turbine bucket cutting tool, H. Geisenhoner	730,362
Turbine bucket, detachable, H. Geisenhoner	730,363
Turbine, steam or gas, J. Stumpf	730,416
Turpentine box, R. L. Gaylord	730,759
Typewriter cabinet, F. W. Tobey	730,319
Typewriter, music, I. F. Badeau	730,508
Typewriter silent key mechanism, Helmond & Kayle	730,456
Typewriting machine, P. T. Dodge	730,520
Umbrella handle, L. Sievert	730,577
Underreamer, E. Strickland	730,415
Universal coupling, H. B. Brazier	730,604
Urinal trap, J. H. Brady	730,227
Valve, N. P. Pratt	730,796
Valve and valve seat, W. S. McLeod	730,559
Valve, balanced, D. C. Prescott	730,690
Valve, balanced slide, J. T. Wilson	730,428
Valve, triple, F. Synnestvedt	730,315
Vehicle body corner construction, H. P. Wells	730,423
Vehicle bolster and truck mechanism, S. Otis	730,688
Vehicle brake, H. Appler	730,507
Vehicle brake, Kurz & Beiser	730,829
Vehicle, steam motor, F. E. Stanley	730,307
Veil holder, P. Till	730,490
Vending machine, A. A. Caille	730,232
Vending machine, L. W. Rubrecht	730,707
Vending machine, automatic, R. P. Elliott	730,624
Voting machine, A. McKenzie	730,788
Wagon, dumping, V. Brown	730,607
Wall and concrete block for same, building, Miracle & Dow	730,780
Washing machine, J. Hofmann	730,538
Washing machine, O. E. Peterson	730,694
Water elevator, C. E. Harris	730,260
Water heater, Haley & Dreyer	730,532
Water heater, H. F. Gabel	730,756
Water tube boiler, G. Hanson	730,765
Wave motor, G. Noble-Todd	730,560
Well boring machine, A. Kopperud	730,272
Well drilling machine, C. Butterfield	730,340

(Continued on page 477.)

Wells, apparatus for removing drill tools from, Irvine & Braden 730,460
Wheel, B. W. Mackenzie-Hughes 730,548
Wheel fastener and axle protector, G. Wood 730,429
Wheels, manufacturing, H. Ehrhardt 730,355
Winding machine, ball or cop, J. Good 730,635
Windmill adjustable foot gear, J. D. Downie 730,524
Window, D. G. Ednie 730,243
Window drier, J. G. Rostek 730,843
Wire instrument, hot, M. C. Rypinski 730,405
Wire straightening machine, F. W. Mallett 730,549
Wire stretcher, J. V. Anderson 730,331
Wiring machine, Wilson & Brown 730,427
Wool washing suds, treating, C. Shepherd. 730,305
Wrench, T. L. Kennedy 730,269
Wrench, J. B. Tupper 730,587

DESIGNS.

Brooch or buckle plate or similar article, P. O. Dickinson 36,351, 36,352
Dish, metal, S. Stohr 36,354
Plate or similar article, C. A. May 36,353
Radiator, J. R. Wotherspoon 36,355
Tiling, O. Bergstrom 36,356
Type, font of, W. Evans 36,358
Type, font of printing, B. Nadall 36,357

TRADE MARKS.

Antitoxic serums, Ichthyol Gesellschaft, Cordes, Hermanni & Co. 40,562
Beer, ale, porter, stout, and malt extract, Kamm & Schellinger Brewing Co. 40,544
Bluing, Troy Laundry Machinery Co. 40,536
Clocks, American El. Nov. & Mfg. Co. 40,566
Compounds used for headache, neuralgia, and similar complaints, proprietary, E. Lautenbach 40,560
Cooling apparatus, certain named, Polar Creamery Co. 40,574
Corsets, Kops Bros. 40,528
Corsets, W. Fitch 40,529
Delft ware and chinaware, Aktieselskabet Aluminia 40,572
Ear protectors, C. Greenwood 40,527
Eggs, F. W. Blankenbuhler 40,538
Flour, Chinese American Commercial Co. 40,539
Formaldehyde compounds, P. W. Squire 40,561
Fur garments, Kohn & Baer 40,526
Hair tonic, W. McCormack 40,550
Harmonicas, mouth, M. Hohner 40,569
Horseshoes, rubber, Calumet Tire Rubber Co. 40,575
Incandescent mantles and burners, American El. Nov. & Mfg. Co. 40,567
Lamps, night, Silver & Co. 40,568
Mattresses, Newark Spring Mattress Co. 40,533
Medical compound for cure of certain named diseases, Weaver's Pharmacy 40,554
Medicinal drinking water, J. F. Christian .. 40,546
Medicinal preparations, certain named, I. Radam 40,552
Medicines for bust development, L. Laing .. 40,553
Ointment, C. P. J. Bryant 40,563, 40,564
Paper, blue print, Keuffel & Esser Co. 40,523
Paper, drawing, Keuffel & Esser Co. 40,516 to 40,519
Paper, tracing, Keuffel & Esser Co. 40,520 to 40,522
Pickles, Glaser, Kohn & Co. 40,537
Preparations for cure of certain named diseases, Fitchmul Company 40,551
Remedies for certain named diseases, J. Krone 40,555
Remedy for tapeworm and similar parasitic ailments, C. F. Boehringer & Soehne 40,558
Remedy for rheumatism, C. Hurley 40,557
Remedy for sore throat, Berg Medicine Co. .. 40,556
Remedy for venereal diseases, C. I. Bickum. 40,559
Shoe insoles, J. Dawson 40,530
Shoes, leather, Goodfellow-Brookes Shoe Co. 40,531
Skin toning effect, liquid having a, J. P. Stratton 40,549
Soap, laundry, Troy Laundry Machinery Co. 40,535
Spool cotton, thread, and sewing cotton, American Thead Co. 40,524, 40,525
Studs, shirt, Horton Angell Co. 40,565
Suspensories, Ohio Truss Co. 40,532
Talking machines and records, Universal Talking Machine Mfg. Co. 40,570
Titanium preparations for leather dyeing, C. Dreher 40,534
Tobacco, smoking, Imperial Tobacco Co., 40,540 to 40,543
Tonics, G. L. Wilson 40,547
Tonics, J. Milhau's Son 40,548
Trunks, traveling bags, and dress suit cases, Stoelting & Dunn 40,571
Water closet bowls, Hitchcock Supply Co. .. 40,572
Water, natural spring, A. A. Low 40,545

LABELS.

"Black Cat Stove Polish," for stove polish, W. B. Eden & Sons 10,092
"Champagne Gum," for chewing gum, Buttles & Co. 10,078
"Creole Comfort," for coffee, Reily, Taylor & Co. 10,081
"El Refinado," for cigars, A. C. Henschel & Co. 10,085
"Gold Leaf Brand Vermont Maple Sap Syrup," for syrup, H. T. Daniels 10,079
"Grape Vino," for beverages, James McIntosh Co. 10,083
"Hardesty's Extract of Nine Bark," for medicine, C. E. Hardesty 10,076
"Iodo-Nuclein, D. & D.," for medicine, Dinet & Delfosse Pharmacal Co. 10,074
"John Mitchell," for cigars, Schmidt & Co. .. 10,088
"Just Fun," for polish, A. H. Olwin 10,090
"Laxative Grapes," for medicine, F. A. Week Co. 10,075
"Little W. J. D.," for cigars, Detor Bros. .. 10,087
"Lotio Retardo," for medicine, F. H. Blackmarr and P. Mandeville 10,073
"Luzianne," for coffee, Reily, Taylor & Co. 10,082
"Olympia," for cigars, E. Delgado 10,089
"Opti-Mo-Jav," for coffee, Reily, Taylor & Co. 10,080
"Panama Ship-Canal Puzzle," for a puzzle box, A. Kinnicutt 10,071
"Pepjulime," for medicine, Associated Drug Co. 10,072
"Queen City Polish," for polish, Queen City Star Polish Co. 10,091
"Riverside Gloss Starch," for starch, Douglas & Co. 10,077
"Saharet," for cigars, E. Mandelbaum 10,084
"Well Made, Good Value," for caps, L. Sable 10,070
"Western Union," for cigars, G. C. Williams 10,086

PRINTS.

"Boston Belting Co., The Original Rubber Man," for mechanical rubber goods, Boston Belting Co. 734
"Cotton Belt Route Playing-Cards," for playing cards, St. Louis Southwestern Railway Co. 729
"McCormick Harvesting Machines," for harvesting machines, International Harvester Co. of America 735
"Men's Apparel," for clothing, Cahn, Wampold & Co. 730
"The Miller Varnish & Paint Remover Paste," for a paint and varnish remover, Barrett-Lindeman Co. 732
"The Miller Varnish Remover," for a varnish remover, Barrett-Lindeman Co. 733
"The Shoe of All Nations," for shoes, Seiter & Kappes 731

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.